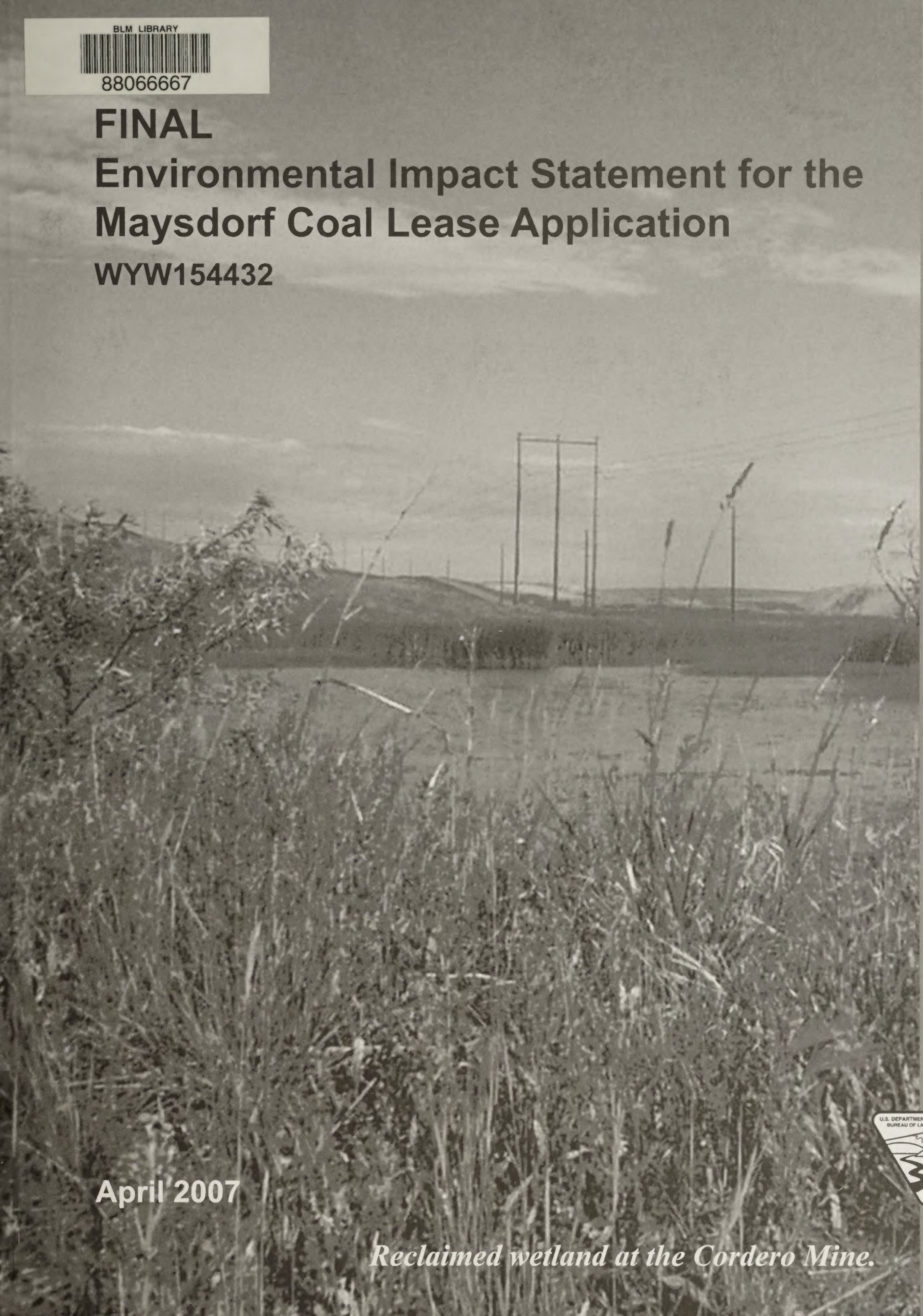
BLM LIBRARY
88066667

FINAL
Environmental Impact Statement for the Maysdorf Coal Lease Application
WYW154432



Reclaimed wetland at the Cordero Mine.

April 2007

BLM

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

MISSION STATEMENT

It is the mission of the Bureau of Land Managment to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/WY/PL-07/014+1320

United States Department of the Interior

TAKE PRIDE IN AMERICA

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

In Reply Refer To:

3425 (LBA)
WYW154432
(Maysdorf)
(922Love)
Phone No: 307-775-6148
Fax No: 307-775-6203

April 6, 2007

Dear Reader:

The Bureau of Land Management (BLM) has prepared this Final Environmental Impact Statement (EIS) to document and disclose the results of an analysis prepared to evaluate the impacts of leasing the Maysdorf Federal coal tract to Cordero Mining Company to extend mining operations at the Cordero Rojo Mine. The mine and adjacent tract are located in the Wyoming Powder River Basin. A copy of this document is provided for your review and comments. The Final EIS may also be reviewed on the BLM Wyoming website at: http://www.blm.gov/wy/st/en/info/NEPA/cfodocs/maysdorf.html.

Copies of the Final EIS are also available for public inspection at the following BLM offices:

Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
Cheyenne, WY 82009

Bureau of Land Management
Casper Field Office
2987 Prospector Drive
Casper, Wyoming 82604

The Draft EIS was published in May 2006 and a formal public hearing on this application to lease Federal coal was held at 7:00 p.m. on June 13, 2006, at the Clarion Hotel, 2009 South Douglas Highway, Gillette, Wyoming. The purpose of the hearing was to receive comments on the proposed coal lease sale, on the fair market value, and on the maximum economic recovery of the Federal coal resources included in the tract. One individual, a representative of Cordero Mining Company, presented comments at the hearing and comments from five entities were received by the BLM on the Draft EIS.

BLM will accept public comments on this Final EIS for thirty (30) days commencing on the date the Environmental Protection Agency publishes a Notice of Availability in the Federal Register. All comments received will be considered in preparation of the Record of Decision for this EIS. BLM is also publishing a Notice of Availability in the Federal Register. Press releases will be submitted to local and state media outlets once the notice is published to notify the public of the final date comments will be accepted.

If you wish to comment on the Final EIS, your comments should relate directly to the document. We request that you make your comments as specific as possible and that you cite the location or locations in the document on which you are commenting. Substantive comments should:

1. give any new information that could alter conclusions;
2. show why or how analysis or assumptions in the EIS are flawed;
3. show errors in data, sources, or methods; or
4. request clarifications that bear on conclusions.

Opinions or preferences will not receive a formal response. However, they will be considered and included as part of the BLM decision making process.

This Final EIS was prepared pursuant to the National Environmental Policy Act and applicable regulations, and other applicable statutes, to address possible environmental and socioeconomic impacts that could result from this project. This Final EIS is not a decision document. Its purpose is to inform the public and the agency decision makers of the impacts of leasing the Maysdorf Federal coal tract to the existing Cordero Mine in Campbell County, Wyoming, and to evaluate alternatives to leasing the Federal coal included in the tract as applied for.

Comments, including names and street addresses of respondents, will be available for public review at the address listed below during regular business hours (7:45 a.m.-4:30 p.m.), Monday through Friday, except holidays, and will be published as part of the Final EIS. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Please send written comments to Bureau of Land Management, Casper Field Office, Attn: Nancy Doelger, 2987 Prospector Drive, Casper, WY 82604. Written comments may also be e-mailed to the attention of Nancy Doelger at "casper_wymail@blm.gov". E-mail comments must include the name and mailing address of the commentor to receive consideration. Written comments may also be faxed to (307)-261-7587.

If you have any questions or would like to obtain additional copies of this Final EIS, please contact Nancy Doelger at (307) 261-7627, or at the above address.

Sincerely,

Mary Trautner
FOR

Robert A. Bennett
State Director

1 Attachment
1 – Final EIS

FINAL ENVIRONMENTAL IMPACT STATEMENT
MAYSDORF LBA TRACT
CAMPBELL COUNTY, WYOMING
ABSTRACT

Lead Agency:	USDI Bureau of Land Management Casper Field Office Casper, Wyoming
Cooperating Agencies:	USDI Office of Surface Mining Reclamation& Enforcement Western Regional Coordinating Center Denver, Colorado
	Wyoming Department of Environmental Quality Cheyenne, Wyoming
	Wyoming State Planning Office Cheyenne, Wyoming
For Further Information Contact:	Nancy Doelger Bureau of Land Management, Casper Field Office 2987 Prospector Drive Casper, WY 82604 (307) 261-7627

Abstract:

This Final Environment Impact Statement (EIS) assesses the environmental consequences of decisions to hold a competitive, sealed-bid sale and issue a lease for a tract of federal coal located adjacent to an existing surface coal mine in Campbell County, Wyoming, subject to standard and special lease stipulations. The Maysdorf Lease by Application (LBA) Tract, as applied for by Cordero Mining Company, includes approximately 2,219.39 acres containing approximately 230 million tons of mineable federal coal. Cordero Mining Company, the operator of the adjacent Cordero Rojo Mine, proposes to mine the tract as a maintenance lease for the existing mine, if a lease sale is held and they acquire the lease.

This Final EIS describes the physical, biological, cultural, historic, and socioeconomic resources in and around the existing mine and the LBA tract. The alternatives in the Final EIS consider the impacts of leasing the tract as it was applied for; leasing a reconfigured tract in order to avoid bypassing Federal coal or to increase competitive interest in the tract, and not leasing the tract. The focus for the impact analysis was based upon resource issues and concerns identified during previous coal leasing analyses and public scoping conducted for this lease application. Potential concerns related to development include impacts to groundwater, air quality, and wildlife and cumulative impacts related to ongoing surface coal mining and other proposed development in the Powder River Basin of Wyoming.

Other Environmental Review or Consultation Requirements:

This Final EIS, in compliance with Section 7(c) of the Endangered Species Act (as amended), identifies any endangered or threatened species which are likely to be affected by the Proposed Action.

#123899286

ID88066667

TN
805
.W8
M39
2007

MAYSDORF COAL LEASE APPLICATION FINAL ENVIROMENTAL IMPACT STATEMENT

Prepared by

WWC Engineering
Sheridan, Wyoming

Under the Direction of

U.S. Department of the Interior
Bureau of Land Management
Casper Field Office
Casper, Wyoming

and

Cooperating Agencies

U.S. Department of Interior
Office of Surface Mining
Reclamation and Enforcement
Denver, Colorado

and

Wyoming Department of Environmental Quality
Land Quality Division
Cheyenne, Wyoming

and

Wyoming State Planning Office
Cheyenne, Wyoming

April 2007

TABLE OF CONTENTS

EXECUTIVE SUMARY ES-1

1.0 INTRODUCTION 1-1
- 1.1 Background 1-1
- 1.2 Purpose and Need for Action 1-9
- 1.3 Regulatory Authority and Responsibility 1-11
- 1.4 Relationship to BLM Policies, Plans, and Programs 1-12
- 1.5 Conformance with Existing Land Use Plans 1-12
- 1.6 Consultation and Coordination 1-15

2.0 PROPOSED ACTION AND ALTERNATIVES 2-1
- 2.1 Proposed Action 2-4
  - 2.1.1 Regulatory Compliance, Mitigation and Monitoring 2-9
  - 2.1.2 Hazardous and Solid Waste 2-15
- 2.2 Alternative 1 2-16
- 2.3 Alternative 2 2-17
- 2.4 Alternative 3 2-20
- 2.5 Alternative 4 2-23
- 2.6 Alternative 5 2-24
- 2.7 Summary of Alternatives and Environmental Consequences 2-26
  - 2.7.1 Background 2-26
  - 2.7.2 Summary of Alternatives 2-27

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 3-1
- 3.1 General Setting 3-5
  - 3.1.1 Climate and Meteorology 3-5
- 3.2 Topography and Physiography 3-5
  - 3.2.1 Affected Environment 3-5
  - 3.2.2 Environmental Consequences 3-6
    - 3.2.2.1 Proposed Action and Alternatives 2 and 3 3-6
    - 3.2.2.2 No Action Alternative 3-8
  - 3.2.3 Regulatory Compliance, Mitigation and Monitoring 3-8
  - 3.2.4 Residual Impacts 3-8
- 3.3 Geology, Mineral Resources, and Paleontology 3-8
  - 3.3.1 General Geology and Coal Resources 3-8
    - 3.3.1.1 Affected Environment 3-8
    - 3.3.1.2 Environmental Consequences 3-11
      - 3.3.1.2.1 Proposed Action and Alternatives 2 and 3 3-11
      - 3.3.1.2.2 No Action Alternative 3-11
    - 3.3.1.3 Regulatory Compliance, Mitigation and Monitoring 3-11
    - 3.3.1.4 Residual Impacts 3-12
  - 3.3.2 Other Mineral Resources 3-12
    - 3.3.2.1 Affected Environment 3-12

TABLE OF CONTENTS (Continued)

3.3.2.1.1 Conventional Oil and Gas 3-12
3.3.2.1.2 Coal Bed Natural Gas (CBNG) .. 3-12
3.3.2.1.3 Other Minerals 3-13
3.3.2.2 Environmental Consequences 3-14
3.3.2.2.1 Proposed Action and Alternatives 2 and 3 3-14
3.3.2.2.2 No Action Alternative 3-16
3.3.2.3 Regulatory Compliance, Mitigation and Monitoring 3-16
3.3.2.4 Residual Impacts 3-17
3.3.3 Paleontology 3-17
3.3.3.1 Affected Environmental 3-17
3.3.3.2 Environmental Consequences 3-19
3.3.3.2.1 Proposed Action and Alternatives 2 and 3 3-19
3.3.3.2.2 No Action Alternative 3-19
3.3.3.3 Regulatory Compliance, Mitigation and Monitoring 3-19
3.3.3.4 Residual Impacts 3-20
3.4 Air Quality 3-20
3.4.1 Background 3-20
3.4.1.1 Regulatory Framework 3-20
3.4.1.1.1 Surface Coal Mine Regulatory Framework 3-25
3.4.1.2 Emission Sources 3-28
3.4.2 Particulate Emissions 3-29
3.4.2.1 Affected Environment for Particulate Emissions 3-29
3.4.2.1.1 Regional Particulate Emissions 3-29
3.4.2.1.2 Site Specific Particulate Emissions 3-33
3.4.2.2 Environmental Consequences Related to Particulate Emissions 3-35
3.4.2.2.1 Proposed Action and Alternatives 2 and 3 3-35
3.4.2.2.2 No Action Alternative 3-41
3.4.2.3 Regulatory Compliance, Mitigation, and Monitoring for Particulate Emissions 3-43
3.4.3 Emissions of Nitrogen Oxides 3-47
3.4.3.1 Affected Environment for NO_x Emissions 3-47
3.4.3.1.1 Regional NO_x Emissions 3-47
3.4.3.1.2 Site Specific NO_x Emissions 3-48
3.4.3.2 Environmental Consequences Related to NO_x Emissions 3-48

TABLE OF CONTENTS (Continued)

3.4.3.2.1 Proposed Action and Alternatives 2 and 3 3-50
3.4.3.2.2 No Action Alternative 3-52
3.4.3.3 Regulatory Compliance, Mitigation, and Monitoring for NO_x Emissions..................... 3-52
3.4.4 Visibility.. 3-55
3.4.4.1 Affected Environment for Visibility.............. 3-56
3.4.4.2 Environmental Consequences for Visibility .. 3-56
3.4.4.2.1 Proposed Action and Alternatives 2 and 3 3-56
3.4.4.2.2 No Action Alternative 3-58
3.4.4.3 Regulatory Compliance, Mitigation, and Monitoring for Visibility Impacts................. 3-58
3.4.5 Acidification of Lakes 3-59
3.4.5.1 Affected Environment 3-60
3.4.5.2 Environmental Consequences 3-60
3.4.5.2.1 Proposed Action and Alternatives 2 and 3 3-60
3.4.5.2.2 No Action Alternative 3-60
3.4.5.3 Regulatory Compliance, Mitigation, and Monitoring 3-60
3.4.6 Residual Impacts to Air Quality 3-61
3.5 Water Resources 3-61
3.5.1 Groundwater.. 3-61
3.5.1.1 Affected Environment 3-61
3.5.1.1.1 Recent Alluvium.................... 3-61
3.5.1.1.2 Wasatch Formation................. 3-62
3.5.1.1.3 Wyodak Coal.......................... 3-64
3.5.1.1.4 Subcoal Fort Union Formation.............................. 3-66
3.5.1.1.5 Lance Formation-Fox Hills Sandstone 3-67
3.5.1.2 Environmental Consequences 3-67
3.5.1.2.1 Proposed Action and Alternatives 2 and 3 3-67
3.5.1.2.2 No Action Alternative 3-74
3.5.1.3 Regulatory Compliance, Mitigation and Monitoring 3-74
3.5.2 Surface Water 3-75
3.5.2.1 Affected Environment 3-75
3.5.2.2 Environmental Consequences 3-79
3.5.2.2.1 Proposed Action and Alternatives 2 and 3 3-79
3.5.2.2.2 No Action Alternative 3-80
3.5.2.3 Regulatory Compliance, Mitigation and Monitoring 3-80

TABLE OF CONTENTS (Continued)

3.5.3 Water Rights 3-81
3.5.3.1 Affected Environment 3-81
3.5.3.2 Environmental Consequences 3-82
3.5.3.2.1 Proposed Action and Alternatives 2 and 3 3-82
3.5.3.2.2 No Action Alternative 3-82
3.5.3.3 Regulatory Compliance, Mitigation and Monitoring 3-83
3.5.4 Residual Impacts 3-83
3.6 Alluvial Valley Floors 3-84
3.6.1 Affected Environment 3-84
3.6.2 Environmental Consequences 3-85
3.6.2.1 Proposed Action and Alternatives 2 and 3 3-85
3.6.2.2 No Action Alternative 3-86
3.6.3 Regulatory Compliance, Mitigation and Monitoring 3-86
3.6.4 Residual Impacts 3-86
3.7 Wetlands 3-86
3.7.1 Affected Environment 3-86
3.7.2 Environmental Consequences 3-88
3.7.2.1 Proposed Action and Alternatives 2 and 3 3-88
3.7.2.2 No Action Alternative 3-89
3.7.3 Regulatory Compliance, Mitigation and Monitoring 3-89
3.7.4 Residual Impacts 3-89
3.8 Soils 3-89
3.8.1 Affected Environment 3-89
3.8.2 Environmental Consequences 3-90
3.8.2.1 Proposed Action and Alternatives 2 and 3 3-90
3.8.2.2 No Action Alternative 3-91
3.8.3 Regulatory Compliance, Mitigation and Monitoring 3-92
3.8.4 Residual Impacts 3-92
3.9 Vegetation 3-92
3.9.1 Affected Environment 3-92
3.9.2 Environmental Consequences 3-94
3.9.2.1 Proposed Action and Alternatives 2 and 3 3-94
3.9.2.2 No Action Alternative 3-96
3.9.3 Threatened, Endangered, Proposed, and Candidate Plant Species, and BLM Sensitive Species 3-97
3.9.4 Regulatory Compliance, Mitigation and Monitoring 3-97
3.9.5 Residual Impacts 3-97
3.10 Wildlife 3-98
3.10.1 General Setting 3-98
3.10.1.1 Affected Environment 3-98
3.10.1.2 Environmental Consequences 3-99
3.10.1.2.1 Proposed Action and Alternatives 2 and 3 3-99
3.10.1.2.2 No Action Alternative 3-100

TABLE OF CONTENTS (Continued)

3.10.2 Big Game 3-100
3.10.2.1 Affected Environment 3-100
3.10.2.2 Environmental Consequences 3-102
3.10.2.2.1 Proposed Action and Alternatives 2 and 3 3-102
3.10.2.2.2 No Action Alternative 3-102
3.10.3 Other Mammals 3-103
3.10.3.1 Affected Environment 3-103
3.10.3.2 Environmental Consequences 3-104
3.10.3.2.1 Proposed Action and Alternatives 2 and 3 3-104
3.10.3.2.2 No Action Alternative 3-106
3.10.4 Raptors 3-106
3.10.4.1 Affected Environment 3-106
3.10.4.2 Environmental Consequences 3-107
3.10.4.2.1 Proposed Action and Alternatives 2 and 3 3-107
3.10.4.2.2 No Action Alternative 3-107
3.10.5 Upland Game Birds 3-107
3.10.5.1 Affected Environment 3-107
3.10.5.2 Environmental Consequences 3-110
3.10.5.2.1 Proposed Action and Alternatives 2 and 3 3-110
3.10.5.2.2 No Action Alternative 3-113
3.10.6 Other Birds 3-113
3.10.6.1 Affected Environment 3-113
3.10.6.2 Environmental Consequences 3-115
3.10.6.2.1 Proposed Action and Alternatives 2 and 3 3-115
3.10.6.2.2 No Action Alternative 3-116
3.10.7 Amphibians, Reptiles, and Aquatic Species 3-116
3.10.7.1 Affected Environment 3-116
3.10.7.2 Environmental Consequences 3-118
3.10.7.2.1 Proposed Action and Alternatives 2 and 3 3-118
3.10.7.2.2 No Action Alternative 3-118
3.10.8 Threatened, Endangered, Proposed, and Candidate Animal Species, and BLM Sensitive Species 3-118
3.10.9 Regulatory Compliance, Mitigation and Monitoring 3-119
3.10.10 Residual Impacts 3-121
3.11 Land Use and Recreation 3-121
3.11.1 Affected Environment 3-121
3.11.2 Environmental Consequences 3-129
3.11.2.1 Proposed Action and Alternatives 2 and 3 3-129
3.11.2.2 No Action Alternative 3-130

TABLE OF CONTENTS (Continued)

3.11.3 Regulatory Compliance, Mitigation and Monitoring... 3-130
3.11.4 Residual Impacts ... 3-131
3.12 Cultural Resources ... 3-131
3.12.1 Affected Environment ... 3-131
3.12.2 Environmental Consequences ... 3-136
3.12.2.1 Proposed Action and Alternatives 2 and 3 ... 3-136
3.12.2.2 No Action Alternative ... 3-136
3.12.3 Native American Consultation ... 3-136
3.12.4 Regulatory Compliance, Mitigation and Monitoring... 3-137
3.12.5 Residual Impacts ... 3-138
3.13 Visual Resources ... 3-138
3.13.1 Affected Environment ... 3-138
3.13.2 Environmental Consequences ... 3-139
3.13.2.1 Proposed Action and Alternatives 2 and 3.. 3-139
3.13.2.2 No Action Alternative ... 3-139
3.13.3 Regulatory Compliance, Mitigation and Monitoring... 3-139
3.13.4 Residual Impacts ... 3-139
3.14 Noise ... 3-140
3.14.1 Affected Environment ... 3-140
3.14.2 Environmental Consequences ... 3-140
3.14.2.1 Proposed Action and Alternatives 2 and 3.. 3-140
3.14.2.2 No Action Alternative ... 3-142
3.14.3 Regulatory Compliance, Mitigation and Monitoring... 3-142
3.14.4 Residual Impacts ... 3-142
3.15 Transportation ... 3-142
3.15.1 Affected Environment ... 3-142
3.15.2 Environmental Consequences ... 3-144
3.15.2.1 Proposed Action and Alternatives 2 and 3.. 3-144
3.15.2.2 No Action Alternative ... 3-146
3.15.3 Regulatory Compliance, Mitigation and Monitoring... 3-146
3.15.4 Residual Impacts ... 3-146
3.16 Hazardous and Solid Waste ... 3-146
3.16.1 Affected Environment ... 3-146
3.16.2 Environmental Consequences ... 3-147
3.16.2.1 Proposed Action and Alternatives 2 and 3.. 3-147
3.16.2.2 No Action Alternative ... 3-147
3.16.3 Regulatory Compliance, Mitigation and Monitoring... 3-147
3.16.4 Residual Impacts ... 3-147
3.17 Socioeconomics ... 3-147
3.17.1 Local Economy ... 3-148
3.17.1.1 Affected Environment ... 3-148
3.17.1.2 Environmental Consequences ... 3-149
3.17.1.2.1 Proposed Action and Alternatives 2 and 3 ... 3-149
3.17.1.2.2 No Action Alternative ... 3-151

TABLE OF CONTENTS (Continued)

3.17.2 Population 3-151
3.17.2.1 Affected Environment 3-151
3.17.2.2 Environmental Consequences 3-152
3.17.2.2.1 Proposed Action and Alternatives 2 and 3 3-152
3.17.2.2.2 No Action Alternative 3-152
3.17.3 Employment 3-152
3.17.3.1 Affected Environment 3-152
3.17.3.2 Environmental Consequences 3-153
3.17.3.2.1 Proposed Action and Alternatives 2 and 3 3-153
3.17.3.2.2 No Action Alternative 3-153
3.17.4 Housing 3-154
3.17.4.1 Affected Environment 3-154
3.17.4.2 Environmental Consequences 3-155
3.17.4.2.1 Proposed Action and Alternatives 2 and 3 3-155
3.17.4.2.2 No Action Alternative 3-156
3.17.5 Local Government Facilities and Services 3-156
3.17.5.1 Affected Environment 3-156
3.17.5.2 Environmental Consequences 3-157
3.17.5.2.1 Proposed Action and Alternatives 2 and 3 3-157
3.17.5.2.2 No Action Alternative 3-158
3.17.6 Environmental Justice 3-158
3.17.6.1 Affected Environment 3-158
3.17.6.2 Environmental Consequences 3-159
3.17.6.2.1 Proposed Action and Alternatives 2 and 3 3-159
3.17.6.2.2 No Action Alternative 3-159
3.17.7 Regulatory Compliance, Mitigation and Monitoring... 3-159
3.17.8 Residual Effects 3-159
3.18 The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity 3-159
3.19 Irreversible and Irretrievable Commitments of Resources 3-162

4.0 CUMULATIVE ENVIRONMENTAL CONSEQUENCES 4-1
4.1 Past, Present, and Reasonably Foreseeable Development 4-2
4.1.1 Coal Development 4-4
4.1.1.1 Coal Mine Development 4-4
4.1.1.2 Coal-Related Development 4-12
4.1.1.2.1 Coal Transportation 4-12
4.1.1.2.2 Electric Power Generation 4-13
4.1.1.2.3 Transmission Lines 4-14
4.1.1.2.4 Coal Conversion Technology..... 4-15

TABLE OF CONTENTS (Continued)

4.1.2 Oil and Gas Development 4-16
4.1.2.1 Conventional Oil and Gas 4-16
4.1.2.2 CBNG Development 4-17
4.1.2.3 Oil and Gas Related Development 4-19
4.1.2.3.1 Pipelines 4-19
4.1.2.3.2 Refineries 4-21
4.1.3 Other Development Activity 4-21
4.1.3.1 Other Mining 4-21
4.1.3.2 Industrial Manufacturing 4-22
4.1.3.3 Reservoirs 4-23
4.1.3.4 Other Non-Energy Development 4-23
4.2 Cumulative Environmental Consequences 4-24
4.2.1 Topography and Physiography 4-27
4.2.2 Geology, Mineral Resources, and Paleontology 4-28
4.2.2.1 Coal 4-28
4.2.2.2 Oil and Gas 4-28
4.2.2.3 Other Mineral Resources 4-29
4.2.2.4 Paleontology 4-29
4.2.3 Air Quality 4-30
4.2.4 Water Resources 4-40
4.2.4.1 Groundwater 4-41
4.2.4.2 Surface Water 4-50
4.2.5 Alluvial Valley Floors 4-53
4.2.6 Soils 4-54
4.2.7 Vegetation, Wetlands and Riparian Areas 4-55
4.2.7.1 Vegetation 4-55
4.2.7.2 Special Status Plant Species 4-56
4.2.7.3 Noxious and Invasive Weed Species 4-56
4.2.7.4 Wetland and Riparian Species 4-58
4.2.8 Wildlife and Fisheries 4-58
4.2.8.1 Game Species 4-59
4.2.8.2 Nongame Species 4-61
4.2.8.3 Fisheries 4-62
4.2.8.4 Special Status Species 4-65
4.2.9 Land Use and Recreation 4-68
4.2.9.1 Grazing and Agriculture 4-69
4.2.9.2 Urban Use 4-69
4.2.9.3 Recreation 4-70
4.2.10 Cultural Resources and Native American Concerns 4-72
4.2.10.1 Prehistoric Sites 4-72
4.2.10.2 Historic Sites 4-74
4.2.10.3 Native American Traditional Cultural Places 4-74
4.2.10.4 Site Protection 4-74
4.2.11 Transportation and Utilities 4-75
4.2.12 Socioeconomics 4-77

TABLE OF CONTENTS (Continued)

4.2.12.1 Employment and the Economic Base 4-78
4.2.12.2 Labor Market Conditions 4-80
4.2.12.3 Personal Income 4-81
4.2.12.4 Population and Demographics 4-82
4.2.12.5 Housing 4-85
4.2.12.6 Public Education 4-87
4.2.12.7 Facilities and Services 4-89
4.2.12.8 Fiscal Conditions 4-90
4.2.12.9 Social Setting 4-92

5.0 CONSULTATION AND COORDINATION 5-1

6.0 REFERENCES CITED 6-1

7.0 GLOSSARY 7-1

8.0 INDEX 8-1

LIST OF TABLES

Table ES-1. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for Maysdorf LBA Tract and Cordero Rojo Mine ES-6
Table ES-2. Projected Maximum Potential Near-field Impacts ES-18
Table ES-3. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas ES-19
Table ES-4. Recent and Projected PRB Population ES-21

Table 1-1. Leases Issued and Exchanges Completed Since Decertification, Powder River Basin, Wyoming 1-5
Table 1-2. Pending LBAs and Exchanges, Powder River Basin, Wyoming 1-7

Table 2-1. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law for all Alternatives 2-10
Table 2-2. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for Maysdorf LBA Tract and Cordero Rojo Mine 2-28
Table 2-3. Summary Comparison of Magnitude and Duration of Direct and Indirect Impacts for the Proposed Action, Alternatives 2 and 3, and the No Action Alternative for the Maysdorf LBA Tract 2-29
Table 2-4. Summary Comparison of Magnitude and Duration of Cumulative Impacts 2-34

TABLE OF CONTENTS (Continued)

Table 3-1. Comparison of Existing and Proposed Cordero Rojo Mine Disturbance Area and Mining Operations 3-4
Table 3-2. Comparison of Average Overburden and Coal Thicknesses and Approximate Postmining Surface Elevation Changes Under the No Action and Action Alternatives 3-7
Table 3-3. Assumed Background Air Pollutant Concentrations, Applicable AAQS, and PSD Increment Values 3-22
Table 3-4. Approximate Distances and Directions from the Maysdorf Tract General Analysis Area to PSD Class I and Class II Sensitive Receptor Areas 3-24
Table 3-5. Summary of WDEQ/AQD Reports on Air Quality Monitoring in Wyoming's PRB, 1980-2004 3-31
Table 3-6. Annual Ambient NO_2 Concentration Data 3-54
Table 3-7. 2001 Through 2004 Annual Mean NO_2 Concentration Data 3-55
Table 3-8. Existing Acid Neutralizing Capacity in Sensitive Lakes 3-61
Table 3-9. Water Supply Wells Possibly Subject to Drawdown if the Maysdorf LBA Tract is Mined 3-83
Table 3-10. Vegetation Types Identified and Mapped Within the Maysdorf LBA Tract Vegetation Analysis Area 3-93
Table 3-11. Distribution of Surface Ownership Within the Maysdorf LBA Tract as Applied for Under the Proposed Action and Area Added Under Alternatives 2 and 3 3-121
Table 3-12. Maysdorf LBA Tract Federal Oil and Gas Lessees of Record ... 3-125
Table 3-13. Sites and Isolated Finds in the Class III Cultural Resource Inventory of the Maysdorf LBA Tract Survey Area 3-135
Table 3-14 Project Socioeconomic Impacts from Leasing the Maysdorf LBA Tract Under the Proposed Action or Alternatives 2 and 3 3-151

Table 4-1. Status and Ownership of Wyoming PRB Coal Mines for the PRB Coal Review Baseline Year 4-6
Table 4-2. Current and Projected Wyoming PRB Coal Mine Development, Lower Production Scenario 4-10
Table 4-3. Current and Projected Wyoming PRB Coal Mine Development, Upper Production Scenario 4-11
Table 4-4. Current and Projected Wyoming PRB Coal-Related Development Scenario 4-13
Table 4-5. Past, Present, and Projected Wyoming PRB Coal Mine and Coal-Related Development Scenario 4-17
Table 4-6. Current and Projected Wyoming PRB Conventional Oil and Gas Development Scenario 4-18
Table 4-7. Current and Projected CBNG Development Scenario for the Wyoming PRB 4-20
Table 4-8. Wyoming PRB Conventional Oil and Gas, CBNG, and Related Development Disturbance and Water Projection 4-20
Table 4-9. Current and Projected Wyoming PRB Total Development Scenario – Task 3 Study Area 4-27

TABLE OF CONTENTS (Continued)

Table 4-10. Projected Maximum Potential Near-field Impacts 4-33
Table 4-11. Maximum Predicted PSD Class I and Sensitive Class II Area Impacts 4-36
Table 4-12. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas 4-37
Table 4-13. Predicted Total Cumulative Change in Acid Neutralizing Capacity of Sensitive Lakes 4-39
Table 4-14. Recoverable Groundwater in the Fort Union/Wasatch Aquifer System 4-42
Table 4-15. Water Use as of 2002 in the Powder/Tongue River Basin 4-51
Table 4-16. Surface Water Availability in the Powder/Tongue River Basin .. 4-51
Table 4-17. Water Use as of 2002 in the Northeast Wyoming River Basins . 4-52
Table 4-18. Surface Water Availability in the Northeast Wyoming River Basins 4-52
Table 4-19. Potential Cumulative Disturbance to Pronghorn Ranges from Development Activities—Lower and Upper Coal Production Scenarios 4-60
Table 4-20. Potential Cumulative Disturbance to White-tailed Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios 4-60
Table 4-21. Potential Cumulative Disturbance to Mule Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios 4-60
Table 4-22. Potential Cumulative Disturbance to Elk Ranges from Development Activities—Low and High Development Scenarios 4-61
Table 4-23. Potential Cumulative Impacts to Greater Sage-Grouse Leks from Coal Mine Development—Upper and Lower Coal Production Development Scenarios 4-68
Table 4-24. Land Use by Surface Ownership 4-69
Table 4-25. AUMs and Acres of Cropland Estimated Unavailable on Lands Disturbed and Not Yet Reclaimed as a Result of Development Activities 4-70
Table 4-26. Square Miles of Projected Cumulative Disturbance and Number of Potentially Affected Cultural Resource Sites in the PRB Coal Review Task 3 Study Area – Lower and Upper Coal Production Scenarios 4-73
Table 4-27. PRB Rail Lines Coal Hauling Capacity and Projected Use 4-77
Table 4-28. Recent and Projected PRB Population 4-84
Table 4-29. Demographic Characteristics 4-86
Table 4-30. Total Housing Stock in 2000 4-86
Table 4-31. Monthly Housing Rents in 2003 in the PRB Study Area 4-86
Table 4-32. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production Under the Lower Production Scenario 4-93

TABLE OF CONTENTS (Continued)

Table 4-33. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production Under the Upper Production Scenario 4-93

LIST OF FIGURES

Figure ES-1. General Location Map with Federal Coal Leases and LBA Tracts ES-2
Figure ES-2a. Maysdorf LBA Alternative Tract Configurations ES-3
Figure ES-2b. Maysdorf LBA Preferred Alternative Tract Configuration ES-3
Figure ES-3. Maximum Modeled PM_{10} and NO_x Concentrations at the Cordero Rojo Mine Ambient Air Boundary for the Year 2007 .... ES-10
Figure ES-4. Life of Mine Drawdown Map, Resulting from Currently Approved Mining With Addition of the Maysdorf LBA Tract ES-12

Figure 1-1. General Location Map with Federal Coal Leases and LBA Tracts 1-2
Figure 1-2. CMC and CRI Mines' Federal Coal Leases and Maysdorf LBA Tract as Applied for 1-8

Figure 2-1a. Maysdorf LBA Alternative Tract Configurations 2-2
Figure 2-1b. Maysdorf LBA Preferred Alternative Tract Configuration 2-2

Figure 3-1. General Analysis Area 3-3
Figure 3-2 Stratigraphic Relationships and Hydrologic Characteristics of Upper Cretaceous, Lower Tertiary, and Recent Geologic Units, PRB, Wyoming 3-9
Figure 3-3. Active PM_{10} Monitoring Stations in Northeastern Wyoming 3-30
Figure 3-4. Wind Rose, Air Quality and Meteorological Stations at the Cordero Rojo Mine 3-34
Figure 3–5. Annual Coal Production and Overburden Removal vs. Ambient Particulates for Cordero Rojo Mine (1995 through 2004) 3-36
Figure 3-6. Maximum Modeled PM_{10} and NO_x Concentrations at the Cordero Rojo Mine Ambient Air Boundary for the Year 2005 3-38
Figure 3-7. Maximum Modeled PM_{10} and NO_x Concentrations at the Cordero Rojo Mine Ambient Air Boundary for the Year 2007 3-39
Figure 3-8. Residences, School Bus Stops, Public Roads, and other Publicly Accessible Facilities Within and Adjacent to the Maysdorf LBA Tract 3-42
Figure 3-9. Visibility in the Badlands and Bridger Wilderness Area 3-57

TABLE OF CONTENTS (Continued)

Figure 3-10. Locations of Currently Active Groundwater Monitoring and Water Supply Wells at the Cordero Rojo Mine 3-68
Figure 3-11. Life of Mine Drawdown Map, Resulting from Currently Approved Mining With Addition of the Maysdorf LBA Tract 3-71
Figure 3-12. Surface Water Features Within and Adjacent to the Maysdorf LBA Tract 3-76
Figure 3-13. Raptor Nest Sites, Sage Grouse Leks, and Prairie Dog Towns Within and Adjacent to the Maysdorf LBA Alternative Tract Configurations 3-105
Figure 3-14. Average Male Sage Grouse Lek Attendance Within the Northeast Wyoming Local Working Group Area 3-111
Figure 3-15. Average Male Sage Grouse Lek Attendance Statewide and Within the Northeast Wyoming Local Sage Grouse Working Group Area and the Thunder Basin National Grasslands 3-111
Figure 3-16. Surface Ownership Within the Maysdorf LBA Tract............ 3-122
Figure 3-17. Oil and Gas Ownership Within the Maysdorf LBA Tract 3-124
Figure 3-18. Relationship Between A-Scale Decibel Readings and Sounds of Daily Life.. 3-141
Figure 3-19. Transportation Facilities Within and Adjacent to the Maysdorf LBA Tract.. 3-143
Figure 3-20. Oil and Gas Pipelines Within and Adjacent to the Maysdorf LBA Tract.. 3-145
Figure 3-21. Estimated Wyoming and Federal Revenues from 2004 Coal Production in Campbell County 3-150

Figure 4-1. Wyoming Study Area for PRB Coal Review Studies Evaluating Current and Projected Levels of Development 4-3
Figure 4-2. Tons of Federal Coal Leased Versus Tons of Coal Mined Since 1990 4-5
Figure 4-3. Projected Total Coal Production from Campbell and Converse Counties Under the Lower and Upper Production Scenarios.. 4-9
Figure 4-4. Wyoming Task 3 Study Area for PRB Coal Review Studies Evaluating Projected Environmental Consequences............. 4-26
Figure 4-5. Extrapolated Extent of Cumulative Drawdown Within the Wyodak Coal Aquifer in the South Gillette Subregion 4-45
Figure 4-6. Projected Campbell County Population and Employment to 2020.. 4-84
Figure 4-7. Projected Housing Demand in the PRB Study Area Under the Lower Production Scenario 4-87
Figure 4-8. Projected School Enrollment Trends to 2020 Under the Lower Production Scenario 4-89

TABLE OF CONTENTS (Continued)

LIST OF APPENDICES

Appendix A	Federal And State Permitting Requirements and Agencies
Appendix B	Unsuitability Criteria for the Maysdorf LBA Tract
Appendix C	Coal Lease-By-Application Flow Chart
Appendix D	Bureau of Land Management Special Coal Lease Stipulations and Form 3400-12 Coal Lease
Appendix E	Biological Assessment for the Maysdorf LBA Tract EIS
Appendix F	BLM Sensitive Species Evaluation for the Maysdorf Coal Lease Application EIS
Appendix G	CBNG Wells Capable of Production on or in Sections Adjacent to the Maysdorf LBA Tract
Appendix H	Comment Letters on the Draft EIS And Responses

Abbreviations and Acronyms Used in this Report

AAQS	Ambient Air Quality Standards
Ac	acre(s)
ACC	Antelope Coal Company
ac-ft	acre-foot, acre-feet
ac-ft/yr	acre-foot per year, acre-feet per year
AIRS	Aerometric Information and Retrieval System
ALC	Ark Land Company
AML	Abandoned Mine Land
ANC	acidification neutralization capacity
ANFO	ammonium nitrate fuel oil
APD	Application for Permit to Drill
APLIC	Avian Power Line Interaction Committee
AQD	Air Quality Division
AQRV	air quality related values
ARCO	Atlantic Richfield Company
AREV	SEO water rights database and program
ARS	Air Resource Specialists, Inc.
AUM	animal unit month
AVF	alluvial valley floor
BACM	best available control measures
BACT	best available control technology
bcf	billion cubic feet
bcy	bank cubic yards
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe
BNSF-UP, BNSF&UP	Burlington Northern Santa Fe and Union Pacific
BN-UP, BN&UP	Burlington Northern-Union Pacific
BOE	barrels of oil equivalent
B.P.	before present
Btu	British thermal units
Btu/lb	British thermal units per pound
CAA	Clean Air Act
CAAA	Clean Air Act Amendment
CAGR	compounded annual growth rate
CANDO	Converse Area New Development Organization
CBNG	coal bed natural gas
CCEDC	Campbell County Economic Development Corporation
CCSD	Campbell County School District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHIA	Cumulative Hydrologic Impact Assessment
CO	carbon monoxide
CO_2	carbon dioxide
COE	U.S. Army Corps of Engineers
CMC	Cordero Mining Company
CREG	Consensus Revenue Estimating Group
CRI	Caballo Rojo, Inc.
CWA	Clean Water Act
cy	cubic yards

Abbreviations and Acronyms Used in this Report

dBA	A-weighted decibels
DEIS	Draft Environmental Impact Statement
DM&E	Dakota, Minnesota & Eastern Railroad Corporation
DOI	Department of the Interior
dv	deciview, a measure of view impairment
EA	Environmental Assessment
EC	elemental carbon particles (re: air quality)
EIS	Environmental Impact Statement
ENCOAL	Encoal Corporation
EOR	enhanced oil recovery
EPA	Environmental Protection Agency
EQC	Environmental Quality Council
ESA	Endangered Species Act
EUR	estimated ultimate recovery
EVG	Erathem-Vanir Geological, PLLC
F	Fahrenheit
FCLAA	Federal Coal Leasing Act Amendments of 1976
FDM	Fugitive Dust Model
FEA	Final Environmental Assessment
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FLM	Federal Land Management
FLPMA	Federal Land Policy Management Act of 1976
FR	Federal Register
ft	feet, foot
ft/day	feet per day
ft/mile	feet per mile
ft^3	cubic feet
FY	fiscal year
g	gram
GAO	General Accounting Office
GAGMO	Gillette Area Ground Water Monitoring Organization
GDP	Gross Domestic Product
gpm	gallons per minute
GSP	Gross State Product
HAP	Hazardous Air Pollutant
hp	horsepower
hr	hour
IBLA	Interior Board of Land Appeals
IMPROVE	Interagency Monitoring of Protected Visual Environments
IWAQM	Interagency Workgroup on Air Quality Monitoring
JRCC	Jacobs Ranch Coal Company
km	kilometers
KMCC	Kerr-McGee Coal Corporation
kV	kilovolts
LAC	limits of acceptable change (re: air quality)
LBA	lease by application
lbs/mmBtu	pounds per million British thermal units
LFC	liquids from coal
LNCM	lands necessary to conduct mining
LOP	life of project

Abbreviations and Acronyms Used in this Report

LRMP	Land and Resource Management Plan
LW	Lower Wyodak coal seam
MACT	Maximum Achievable Control Technology
MBHFI	migratory birds of high federal interest
μeq/L	microequivalents per liter
$\mu g/m^3$	micrograms per cubic meter
μmhos/cm	micromhos per centimeter
mcf	thousand cubic feet
MDEQ	Montana Department of Environmental Quality
MDEQ/AWM	Montana Department of Environmental Quality/Air and Waste Management Bureau
MEI	maximally exposed individual
mg/L	milligrams per liter
MLA	Mineral Leasing Act of 1920
MLE	most likely exposure
mm	million
mmbcy	million bank cubic yards
mmbo	million barrels of oil
mmcfpd	million cubic feet of gas per day
mmgpy	million gallons per year
mmt	million tons
mmtpy	million tons per year
mph	miles per hour
MSA	Metropolitan Statistical Area
MW	megawatts
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAPG	North American Power Group
NEPA	National Environmental Policy Act of 1969
NIOSH	National Institute of Occupational Safety and Health
NO	nitrogen oxide
NOAA	National Oceanic and Atmospheric Administration
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPS	National Park Service
NRCS	National Resource Conservation Service
NRHP	National Register of Historic Places
NSPS	National Source Performance Standards
NWI	National Wetlands Inventory
O_3	photochemical oxidants
OC	organic carbon particles
ORV	off road vehicle
OSHA	Occupational Safety and Health Administration
OSM	Office of Surface Mining Reclamation & Enforcement
PECs	passive enclosure control systems
PFRC	probable fossil yield classification
P.M.	Prime Meridian
$PM_{2.5}$	particulates finer than 2.5 microns in effective diameter
PM_{10}	particulates finer than 10 microns in effective diameter
PMT	postmining topography
POD	Plan of Development

Abbreviations and Acronyms Used in this Report

PP&L	Pacific Power and Light Company
ppm	parts per million
PRB	Powder River Basin
PRBRC	Powder River Basin Resource Council
PRCC	Powder River Coal Company
PRRCT	Powder River Regional Coal Team
PSD	prevention of significant deterioration
R2P2	Resource Recovery and Protection Plan
RH	relative humidity
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
RV	recreational vehicle
SAR	sodium absorption ratio
SARA	Superfund Amendment & Reauthorization Act of 1986
scf/ton	standard cubic feet per ton
SCSD	Sheridan County School District
SEIS	Supplemental Environmental Impact Statement
SEO	State Engineer's Office
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Stations
SMCRA	Surface Mining Control and Reclamation Act of 1977
SO_2	sulfur dioxide
SPRB	South Powder River Basin
STB	Surface Transportation Board
T&E	threatened and endangered
TBCC	Thunder Basin Coal Company, LLC
TBNG	Thunder Basin National Grassland
TCC	Triton Coal Company, LLC
TDS	total dissolved solids
TEOM	tapered element oscillating microbalance
TPY	tons per year
TSP	total suspended particulates
TSS	total suspended solids
TWC	Thunderbird Wildlife Consulting, Inc.
UP	Union Pacific
U.S.	United States
USC, U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USDA-FS	U.S. Department of Agriculture - Forest Service
USDI	U.S. Department of the Interior
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
UW	Upper Wyodak coal seam
VMT	vehicle miles traveled
VOCs	volatile organic compounds
VRM	visual resource management
WA	Wilderness Area
WAAQS	Wyoming Ambient Air Quality Standards
WAQSR	Wyoming Air Quality Standards and Regulations

Abbreviations and Acronyms Used in this Report	
WARMS	Wyoming Air Resources Monitoring System
WCIC	Wyoming Coal Information Committee
WDEQ	Wyoming Department of Environmental Quality
WDEQ/AQD	Wyoming Department of Environmental Quality/Air Quality Division
WDEQ/LQD	Wyoming Department of Environmental Quality/Land Quality Division
WFA	Western Fuels Association
WGFD	Wyoming Game and Fish Department
WMA	Wyoming Mining Association
WOC	Wyoming Outdoor Council
WOGCC	Wyoming Oil and Gas Conservation Commission
WRCC	Western Regional Climate Center
WRRI	Water Resources Research Institute
WSBLC	Wyoming State Board of Land Commissioners
WSFC	Wyoming School Facilities Commission
WSGS	Wyoming State Geological Survey
WSO-RMG	Wyoming State Office Reservoir Management Group
WYDOT	Wyoming Department of Transportation

EXECUTIVE SUMMARY

On September 20, 2001, CMC[1] filed an application with the BLM for federal coal reserves adjacent to CMC's Cordero Rojo Mine in a tract located to the west and south of the existing mine in Campbell County, Wyoming (Figures ES-1 and ES-2). This coal lease application was assigned case number WYW154432, and is referred to as the Maysdorf LBA Tract. CMC subsequently submitted modifications to their coal lease application to the BLM on May 21, 2002; July 1, 2004; and November 8, 2004. In the application submitted in November, 2004, the Maysdorf LBA Tract as modified by the applicant includes approximately 2,219.39 acres and an estimated 230.3 million tons of mineable federal coal reserves. The lands applied for in this application are located approximately 15 miles south-southeast of the city of Gillette, Wyoming.

This lease application was reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands Authorization, who determined that the application and the lands involved met the requirements of the regulations governing coal leasing on application at 43 CFR 3425.1. The PRRCT reviewed this lease application at public meetings held on May 30, 2002, in Casper, Wyoming and on April 27, 2005, in Gillette, Wyoming. At those meetings, the PRRCT recommended that the BLM continue to process the lease application.

In order to process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal and fulfill the requirements of the NEPA by evaluating the environmental consequences of leasing the federal coal.

To evaluate the environmental impacts of leasing and mining the coal, the BLM must prepare an EA or an EIS to evaluate the site-specific and cumulative environmental and socioeconomic impacts of leasing and developing the federal coal in the application area. The BLM made a decision to prepare an EIS for this lease application.

The Draft EIS was mailed to the public in May, 2006. The EPA published a notice announcing the availability of the Draft EIS in the *Federal Register* on May 26, 2006. The BLM published a Notice of Availability and Notice of Public Hearing in the *Federal Register* on May 26, 2006. A 60-day comment period on the Draft EIS commenced with publication of the EPA's Notice of Availability and ended on July 25, 2006. A formal public hearing was held on June 13, 2006. BLM received written comments from five entities, which are included, with responses, in Appendix H of the Final EIS. Parties on the distribution list will be sent copies of the Final EIS when it is completed, and the EPA and BLM will each publish a Notice of Availability for the Final EIS. After a 30-day availability period, BLM will make a decision to hold or not to hold a competitive lease sale for the federal

---

[1] Refer to page xv for a list of abbreviations and acronyms used in this document.

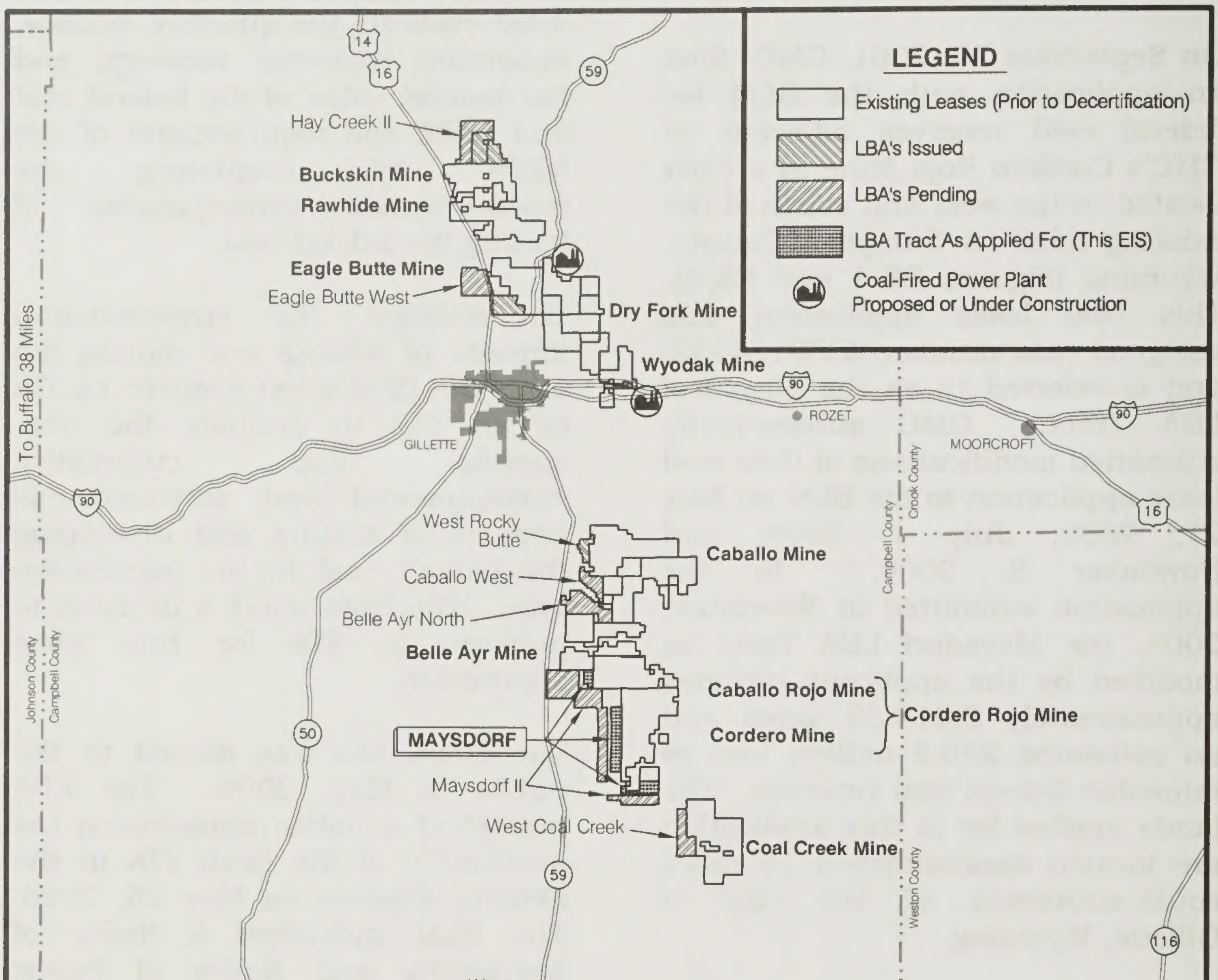

LEGEND
Existing Leases (Prior to Decertification)
LBA's Issued
LBA's Pending
LBA Tract As Applied For (This EIS)
Coal-Fired Power Plant Proposed or Under Construction
14
16
59
Hay Creek II
Buckskin Mine
Rawhide Mine
Eagle Butte Mine
Eagle Butte West
Dry Fork Mine
Wyodak Mine
90
ROZET
GILLETTE
MOORCROFT
To Buffalo 38 Miles
90
16
Crook County
Campbell County
West Rocky Butte
Caballo Mine
Caballo West
Belle Ayr North
Belle Ayr Mine
Johnson County
Campbell County
Caballo Rojo Mine
Cordero Rojo Mine
Cordero Mine
50
MAYSDORF
Maysdorf II
West Coal Creek
Coal Creek Mine
Weston County
59
116
West Jacobs Ranch
RENO JUNCTION
WRIGHT
Jacobs Ranch Mine
Hilight Field
West Hilight
Black Thunder Mine
450
To Newcastle 29 Miles
387
Porcupine
North Antelope Rochelle Mine
Campbell County
Converse County
Weston County
Niobrara County
West Antelope II
Antelope Mine
59
SCALE: 1"= 10 MILES
To Douglas 46 Miles

Figure ES-1. General Location Map with Federal Coal Leases and LBA Tracts.

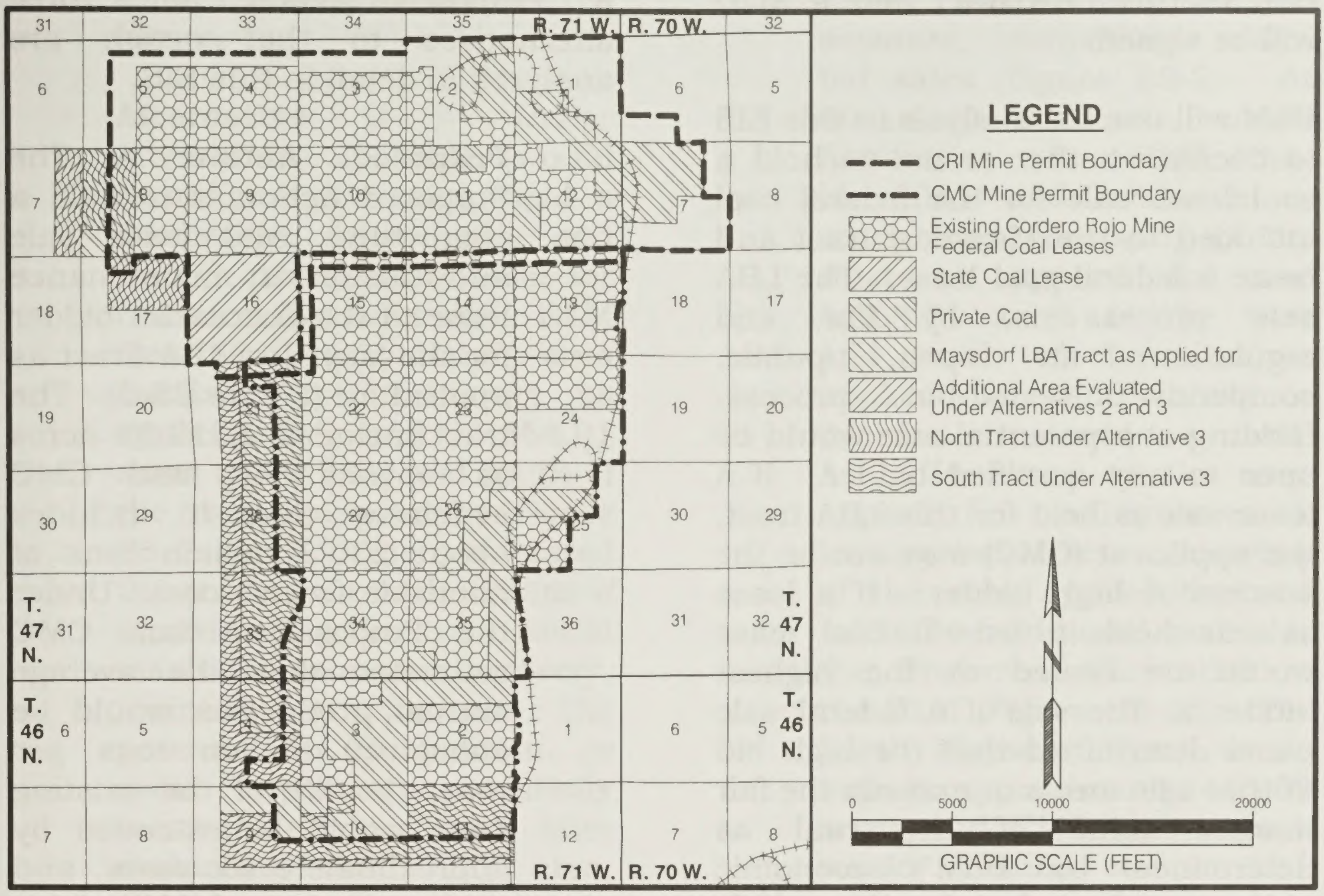

R. 71 W.
R. 70 W.
T. 47 N.
T. 46 N.
LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Existing Cordero Rojo Mine Federal Coal Leases
State Coal Lease
Private Coal
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3
South Tract Under Alternative 3
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure ES-2a. Maysdorf LBA Alternative Tract Configurations.

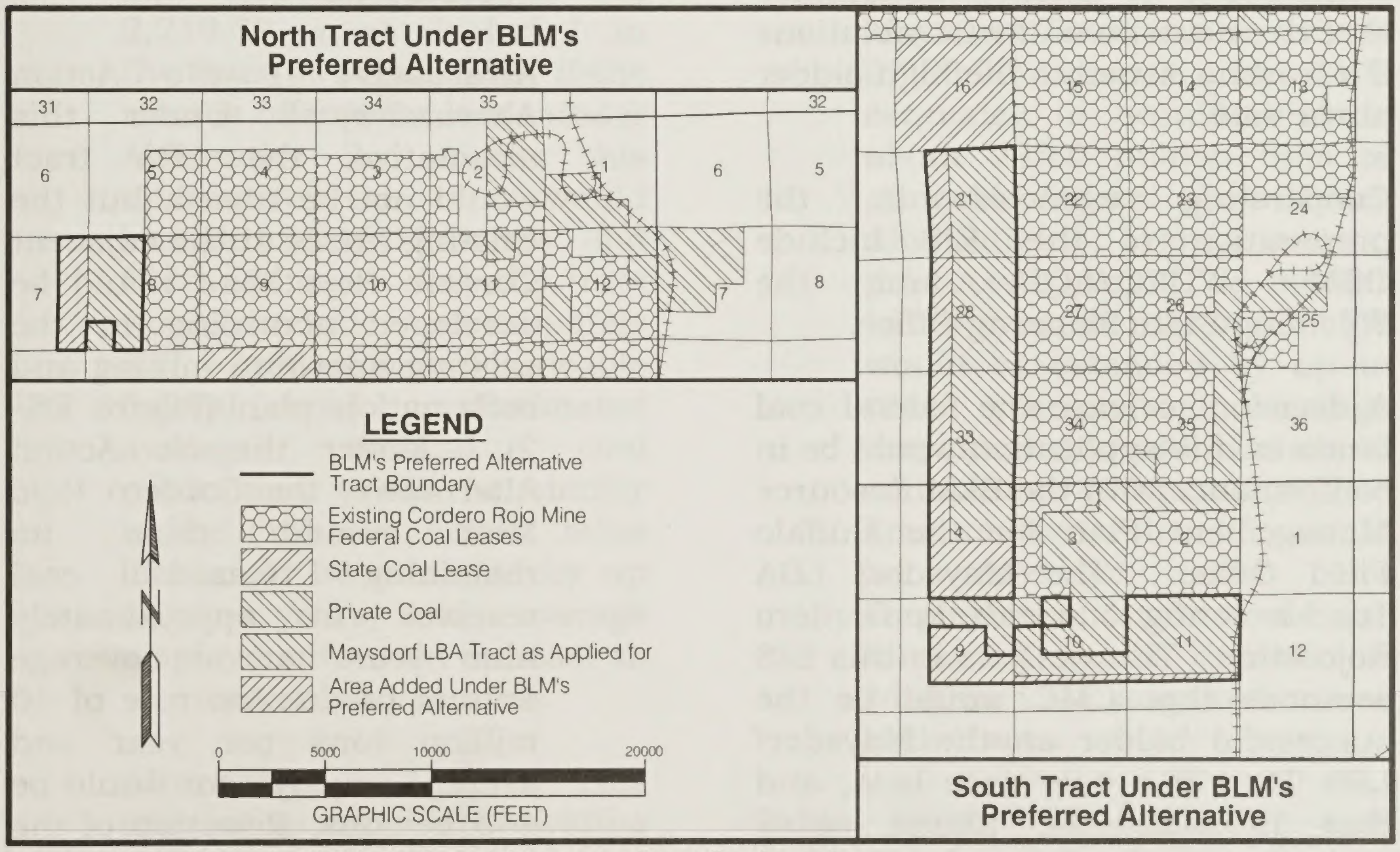

North Tract Under BLM's Preferred Alternative
South Tract Under BLM's Preferred Alternative
LEGEND
BLM's Preferred Alternative Tract Boundary
Existing Cordero Rojo Mine Federal Coal Leases
State Coal Lease
Private Coal
Maysdorf LBA Tract as Applied for
Area Added Under BLM's Preferred Alternative
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure ES-2b. Maysdorf LBA Preferred Alternative Tract Configuration.

coal in this LBA tract and a ROD will be signed.

BLM will use the analysis in this EIS to decide whether or not to hold a coal lease sale for the federal coal included in the Maysdorf tract and issue a federal coal lease. The LBA sale process is, by law and regulation, an open, public, competitive sealed-bid process. Bidding at a potential sale would be open to any qualified bidder. If a lease sale is held for this LBA tract, the applicant (CMC) may not be the successful high bidder. If a lease sale is held, a federal coal lease would be issued to the highest bidder at the sale if a federal sale panel determined that the high bid at that sale meets or exceeds the fair market value of the coal as determined by BLM's economic evaluation, and if the U.S. Department of Justice determines that there are no antitrust violations if a lease is issued to the high bidder at the sale.

Cooperating agencies in the preparation of this EIS include OSM, WDEQ/LQD, and the Wyoming State Planning Office.

A decision to lease the federal coal lands in this application would be in conformance with the BLM Resource Management Plan for the Buffalo Field Office. The Maysdorf LBA Tract is contiguous with the Cordero Rojo Mine. The analysis in this EIS assumes that CMC would be the successful bidder on the Maysdorf LBA Tract if a sale were held, and that it would be mined as a maintenance tract for the Cordero Rojo Mine.

A Proposed Action and three alternatives to that action are analyzed in detail in this EIS.

- **Proposed Action** - The Proposed Action is to hold a competitive coal lease sale and issue a maintenance lease to the successful bidder for the Maysdorf LBA Tract as applied for (Figure ES-2). The tract includes 2,219.39 acres as applied for, and CMC estimates that it includes about 230.3 million tons of mineable federal coal. Under the Proposed Action, CMC estimates that the average annual production would be about 40 million tons per year, the life of the existing mine would be extended by approximately six years, and employment would be about 463 persons.

- **Alternative 1** (No Action Alternative) - Under this alternative, the LBA tract would not be leased, but the existing leases at the adjacent Cordero Rojo Mine would be developed according to the existing approved mining and reclamation plan (Figure ES-2). Under the No Action Alternative, the Cordero Rojo Mine would mine its remaining leased coal reserves in approximately nine years at an average annual production rate of 40 million tons per year and average employment would be 443 persons. Rejection of the lease application would not preclude an application to lease the federal coal in the future.

- **Alternative 2** - Under Alternative 2, BLM would reconfigure the tract, hold a competitive lease sale, and issue a maintenance lease for the reconfigured tract. BLM identified a study area consisting of the tract as applied for and 1,368.01 acres to the west and south of the tract as applied for (Figure ES-2a). BLM then evaluated the study area to determine if reconfiguring the tract would maximize economic recovery, maintain or increase the potential for competition, or avoid bypassing potentially recoverable federal coal. After evaluating the study area, BLM has made a decision to add 1,126.74 acres to the 2,219.39 acres included in the tract as applied for, if the tract is offered for lease under Alternative 2. Under this alternative, the tract would include 3,346.13 acres and CMC estimates that the tract would include approximately 337.9 million tons of mineable federal coal. Estimated average annual coal production would be similar to the Proposed Action, mine life would be extended by up to nine years, and average employment would increase to as much as 495 persons.

- **Alternative 3** - This alternative considers dividing the tract as applied for into a north tract and a south tract and offering one or both of those tracts for sale at separate, competitive sealed bid sales (Figure ES-2). As discussed above under Alternative 2, BLM has identified and evaluated a study area consisting of the tract as applied for and 1,368.01 acres to the west and south of the tract as applied for and made a decision to add a total 1,126.74 acres to the area applied for. Alternative 3, leasing two tracts consisting of the area applied for and 1,126.74 additional acres, is the Preferred Alternative of the BLM (Figure ES-2b). The North Maysdorf Tract would include approximately 445.89 acres and CMC estimates it would include about 52.8 million tons of mineable federal coal. The South Maysdorf Tract would include 2,900.24 acres and CMC estimates it would include about 285.0 million tons of mineable federal coal. Under Alternative 3, average annual production would be similar to Alternative 2, mine life would be extended by up to nine years, and average employment would increase to as much as 495 persons. The amount that mine life would be extended and the employment level would be increased would depend on whether CMC acquired one or both tracts.

Table ES-1 summarizes coal production, surface disturbance, and mine life for the Cordero Rojo Mine under each alternative. The

Table ES-1. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for Maysdorf LBA Tract and Cordero Rojo Mine.

Item	**No Action Alternative (Existing Cordero Rojo Mine)**	**Added by Proposed Action**	**Added by Alternative 2**	**Added by Alternative 3 (Preferred Alternative)**	
				NorthTract	**South Tract**
In-Place Coal (as of 1/1/06)	388.1 mmt	234.8 mmt	342.3 mmt	52.8 mmt	289.5 mmt
Mineable Coal (as of 1/1/06)	388.1 mmt	230.3 mmt	337.9 mmt	52.8 mmt	285.0 mmt
Recoverable Coal (as of 1/1/06)[1]	364.8 mmt	216.5 mmt	317.6 mmt	49.6 mmt	268.0 mmt
Coal Mined Through 2005	650.3 mmt	—	—	—	—
Lease Area[2]	10,629.1 ac	2,219.4 ac	3,346.1 ac	445.9 ac	2,900.2 ac
Total Area To Be Disturbed[2]	14,694.0 ac	2,558.2 ac	4,024.7 ac	825.8 ac	3,198.9 ac
Permit Area[2]	16,804.4 ac	7,858.9 ac	7,858.9 ac	857.8 ac	7001.1 ac
Average Annual Post-2005 Coal Production	40.0 mmt	0 mmt	0 mmt	0 mmt	0 mmt
Remaining Life of Mine (post-2005)	9 yrs	6 yr	9 yr	3 yr	9 yr
Average Number of Employees	443	20	52	5	2
Total Projected State Revenues (post-2005)[3]	$412.5 million	$279.4 – $356.5 million	$409.8 - $523.0 million	$64.0 - $81.7 million	$345.8 – $441.3 million
Total Projected Federal Revenues (post-2005)[4]	$280.7 million	$201.2 - $278.3 million	$295.1 - $408.3 million	$46.1 - $63.8 million	$249.0 - $344.5 million

[1] Assumes 94 percent recovery of mineable coal. This figure excludes all coal that would not be mined beneath BNSF & UP railroad ROW and all mining losses that occur during normal mining operations.

[2] The lease area includes federal coal leases only and does not include state and private coal within the permit boundary. The disturbed area exceeds the leased area (total federal, state and private) because of the need for highwall reduction, topsoil removal, and other mine support activities outside the lease boundaries. The permit area is larger than the leased or disturbed area to assure that all disturbed lands are within the permit boundary and to allow an easily defined legal land description.

[3] Revenues to the State of Wyoming include severance taxes, property and production (Ad Valorum) taxes, sales and use taxes, and Wyoming's share of federal royalty payments, AML fees, and bonus bids. State revenues are based on $0.31 per ton estimate for severance taxes × amount of recoverable coal, plus $0.26 per ton estimate for Ad Valorum taxes × amount of recoverable coal, plus $0.023 per ton estimate for sales and use taxes × amount of recoverable coal, plus $5.80 per ton (projected for 8,400-Btu coal) price × amount of recoverable coal × federal royalty of 12.5 percent minus federal's 50 percent share, plus $0.35 per ton for AML fees × amount of recoverable coal minus federal's 50 percent share, plus bonus payment on LBA leased coal of $0.30 to $0.97 per ton (based on the range of bonus payments made for the last 6 LBAs sold in 2004 and 2005) × amount of mineable coal minus federal's 50 percent share.

[4] Federal revenues include black lung taxes and the federal government's share of federal royalty payments, AML fees, and bonus bids. Federal revenues are based on $5.80 per ton (projected for 8,400-Btu coal) price × amount of recoverable coal × black lung tax of 4.0 percent, plus $5.80 per ton (for 8,400-Btu coal) price × amount of recoverable coal × federal royalty of 12.5 percent minus state's 50 percent share, plus $0.35 per ton for AML fees × amount of recoverable coal minus state's 50 percent share, plus bonus payment on LBA leased coal of $0.30 to $0.97 per ton (based on the range of bonus payments made for the last 6 LBAs sold in 2004 and 2005) × amount of mineable coal minus state's 50 percent share.

environmental impacts of mining the LBA tract would be similar under the Proposed Action and Alternatives 2 and 3.

Under all three alternatives, some of the coal included in the Maysdorf LBA Tract is not currently considered to be recoverable due to presence of the BNSF & UP railroad tracks and associated ROW; the tract also includes an area where no coal is present due to erosion or non-deposition (a "no-coal" zone). Although these lands would not be mined, they are included in the tract to:

- allow maximum recovery of all the mineable coal that is adjacent to but outside of the railroad ROW and its associated buffer zone;
- allow maximum recovery of all of the mineable coal that surrounds the "no-coal" zone; and
- comply with the coal leasing regulations that do not allow leasing of less than 10-acre aliquot parts.

Surface ownership within the Maysdorf LBA Tract as applied for under the Proposed Action and the additional lands evaluated under Alternatives 2 and 3 consists primarily of private lands intermingled with some federal lands. The federal lands are administered by the BLM.

The BLM has determined that one owner of surface lands included in the Maysdorf LBA Tract meets the requirements listed under 43 CFR 3400.0-5gg and is therefore considered to be a qualified surface owner. In the event that surface owner does not consent to leasing their land, which is located in the north half of Section 33, T.47N., R.71W., it would be removed from the tract prior to holding a lease sale (Figure ES-2b).

Two Native American tribes have indicated they have concerns with disturbance of the cultural sites in this area, but no specific sites have been identified as traditional cultural properties by either tribe at this time. If one or both of these tribes identifies concerns related to sites significant to the history, culture, or religion of their tribes or sites that are sacred, those concerns must be addressed prior to leasing.

Other alternatives that were considered but not analyzed in detail include holding a competitive coal lease sale and issuing a lease to the successful bidder (not the applicant) for the purpose of developing a new stand-alone mine, and delaying the sale of the Maysdorf LBA Tract as applied for to increase the benefit to the public afforded by higher coal prices and/or to allow more complete recovery of the potential CBNG resources in the tract prior to mining.

Critical elements of the human environment (BLM 1988) that could be affected by the proposed project include air quality, cultural resources, Native American religious concerns, T&E plant and animal species, hazardous or solid wastes, water quality, wetlands/riparian zones, floodplains, environmental justice, and invasive nonnative species. Four critical elements (areas of critical environmental concern, prime and unique farmland, wild and scenic rivers, and wilderness) are not present in the project area and are not addressed further. In addition to the critical elements that are potentially present in the project area, the EIS discusses the status and potential effects of the project on topography and physiography, geology and mineral resources, soils, water availability and quality, AVFs, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics.

The project area is located in the PRB, a part of the Northern Great Plains that includes most of northeastern Wyoming. The tract is located in the eastern part of the PRB, in an area consisting primarily of a dissected rolling upland plain with low relief, broken by low red-capped buttes, mesas, hills, and ridges. Elevations range from about 4,510 ft to 4,770 ft above sea level and slopes range from flat to around 40 percent. There is one mineable coal seam at the Cordero Rojo Mine and within the Maysdorf LBA Tract. Locally, this coal zone is referred to as either the Wyodak or the Wyodak-Anderson. Mining would remove an average of 222 ft of overburden and 62 ft of coal on about 2,076 acres under the Proposed Action. Mining would remove an average of 238.5 ft of overburden and 62 ft of coal on about 3,160 acres under Alternatives 2 and 3. Up to five noncoal splits or partings occur within the main coal seam, but they are typically local, discontinuous lenses of carbonaceous clay or shale that are less than one ft thick.

The existing topography on the LBA tract would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. Following reclamation, the average surface elevation would be lower due to removal of the coal. The reclaimed land surface would approximate premining contours and the basic drainage network would be retained; however, the reclaimed surface would contain fewer and gentler topographic features. This could contribute to reduced habitat diversity and wildlife carrying capacity on the LBA tract after reclamation. These topographic changes would not conflict with regional land use, and the postmining topography would adequately support anticipated postmining land use.

The geology from the base of the coal to the land surface would be subject to considerable long-term change on the LBA tract under any of the action alternatives. After removal of the coal, the replaced overburden would be a relatively homogeneous mixture compared to the premining layered overburden.

There are currently four conventional oil wells that are capable of producing on the tract as applied for and 24 CBNG wells have been completed and are (or have been) capable of producing from the Wyodak-Anderson coal zone in the sections that include the Maysdorf

LBA Tract under the Proposed Action. CBNG production has been occurring in this area for almost 10 years, but there are still undrilled 40-acre spacing units in and around the Maysdorf LBA Tract and there has been little recent interest in drilling additional wells in this area. CBNG resources that are not recovered prior to mining would be vented to the atmosphere and irretrievably lost when the coal is removed. BLM's policy is to optimize recovery of both resources, ensure the public receives a reasonable return, and encourage agreements between lessees or use BLM authority to minimize loss of publicly owned resources. Conventional oil and gas wells would have to be plugged and abandoned during mining but could be recompleted after mining if the remaining reserves justify the expense of the recompletion.

No significant or unique paleontological resources have been recorded in the general analysis area.

Moderately adverse short-term impacts to air quality would be extended onto the Maysdorf LBA Tract during the time it is mined if a lease is issued. Modeling for the current Cordero Rojo Mine permit predicted no exceedances of the annual PM_{10} NAAQS at a 65-mmtpy production rate and no violations of the 24-hour or annual particulate standards (TSP or PM_{10}) have been issued by WDEQ/AQD at the Cordero Rojo Mine. Figure ES-3 shows the maximum modeled PM_{10} and NO_x concentrations at the Cordero Rojo Mine for 2007. If the Cordero Rojo Mine acquires and mines the Maysdorf LBA Tract, the mine would produce at an average annual rate of 40 mmtpy for an additional six to nine years. There would be an increase in overburden thickness but fugitive dust emissions would be expected to remain within daily and annual NAAQS limits.

Low-lying, gaseous orange clouds containing NO_x that can be transported by wind can sometimes form from overburden blasting prior to coal removal. Exposure to NO_x can cause adverse health effects. EPA has expressed concerns that NO_x levels in some blasting clouds may be sufficiently high at times to cause human health effects. As a result of these incidents, WDEQ/LQD has directed some mines to take steps designed to mitigate the effects of NO_2 emissions occurring from overburden blasting. There have been no reported events of public exposure to NO_2 from blasting activities at the Cordero Rojo Mine through 2005. The mine has employed measures to control/limit public exposure to intermittent, short-term (blasting) releases.

Public exposure to emissions caused by surface mining operations is most likely to occur along publicly accessible roads and highways that pass through the area of the mining operations. State Highway 59 is several miles west of the LBA tract (Figure ES-1) and several county roads provide public and private access within and near the proposed lease area. Occupants of dwellings in the area could also be affected. There are occupied dwellings located approximately one to 3.5 miles west,

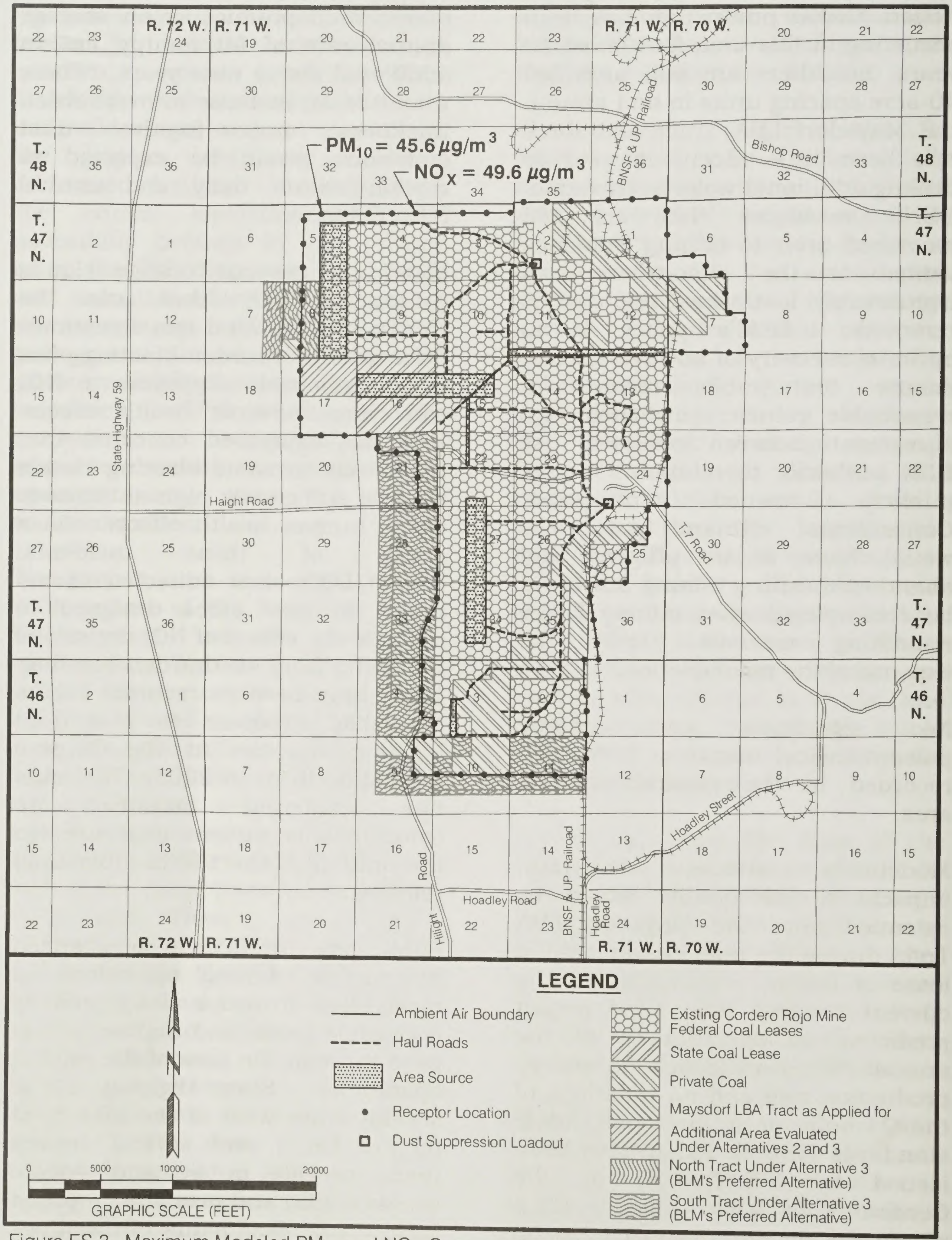

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
PM10 = 45.6 µg/m3
NOX = 49.6 µg/m3
BNSF & UP Railroad
Bishop Road
State Highway 59
Haight Road
T-7 Road
Hoadley Street
Hoadley Road
Hilight Road
LEGEND
Ambient Air Boundary
Haul Roads
Area Source
Receptor Location
Dust Suppression Loadout
Existing Cordero Rojo Mine Federal Coal Leases
State Coal Lease
Private Coal
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure ES-3. Maximum Modeled PM_{10} and NO_X Concentrations at the Cordero Rojo Mine Ambient Air Boundary for the Year 2007.

two miles south-southeast, and 3.5 miles east of the Maysdorf LBA Tract. A school bus stop is located on Highway 59 approximately 2.5 miles west of the LBA tract.

Mining would disturb the coal aquifer and the aquifers in the overburden above the coal within the Maysdorf LBA Tract. The coal aquifer and any water-bearing strata in the overburden would be removed and replaced with unconsolidated backfill. The area of drawdown in the areally-continuous coal aquifer related to mining operations at the Cordero Rojo Mine would be expected to increase roughly in proportion to the increase in area affected by mining. Figure ES-4 shows the projected life-of-mine drawdown that would result from currently approved mining on the existing leases with the addition of the Maysdorf LBA Tract. The area of drawdown in the discontinuous overburden aquifers would be smaller. The data available indicate that, after reclamation, the hydraulic properties of the backfill would be comparable to the properties of the premining overburden and coal aquifers. TDS levels in groundwater from the backfill could initially be expected to be higher than in the premining overburden and coal aquifers, but would be expected to meet Wyoming Class III standards for use as livestock water.

Mining would not directly disturb aquifers below the coal. CMC has five water supply wells completed in aquifers below the coal and these wells would be used to supply water for a longer period of time if the Maysdorf LBA Tract is leased.

The Belle Fourche River and its tributaries drain the existing Cordero Rojo Mine permit area and the Maysdorf LBA Tract. The river is currently diverted from its natural channel as a result of mining within the existing mine permit area. The river would also be diverted during mining of the LBA tract, but would be restored during reclamation. After mining and reclamation are complete, surface water flow, quality, and sediment discharge would approximate premining conditions.

Surface water quality varies with flow and/or season. Changes in runoff characteristics and sediment discharges would occur during mining of the LBA tract, and erosion rates could reach high values on the disturbed areas as a result of vegetation removal. However, state and federal regulations require that surface runoff from mined lands be treated to meet effluent standards, so sediment would be deposited in ponds or other sediment-control devices.

Under SMCRA, mining on AVFs is prohibited unless the affected AVF is undeveloped rangeland, which is not significant to farming, or if the affected AVF is of such small acreage that it would have a negligible impact on a farm's agricultural production. The determination of significance to farming is made by WDEQ/LQD. The Maysdorf LBA Tract has not yet been formally evaluated for the presence of AVFs, but the general absence of flood irrigation activity in this area indicates that it is unlikely that the Maysdorf LBA Tract includes AVFs that meet the criteria

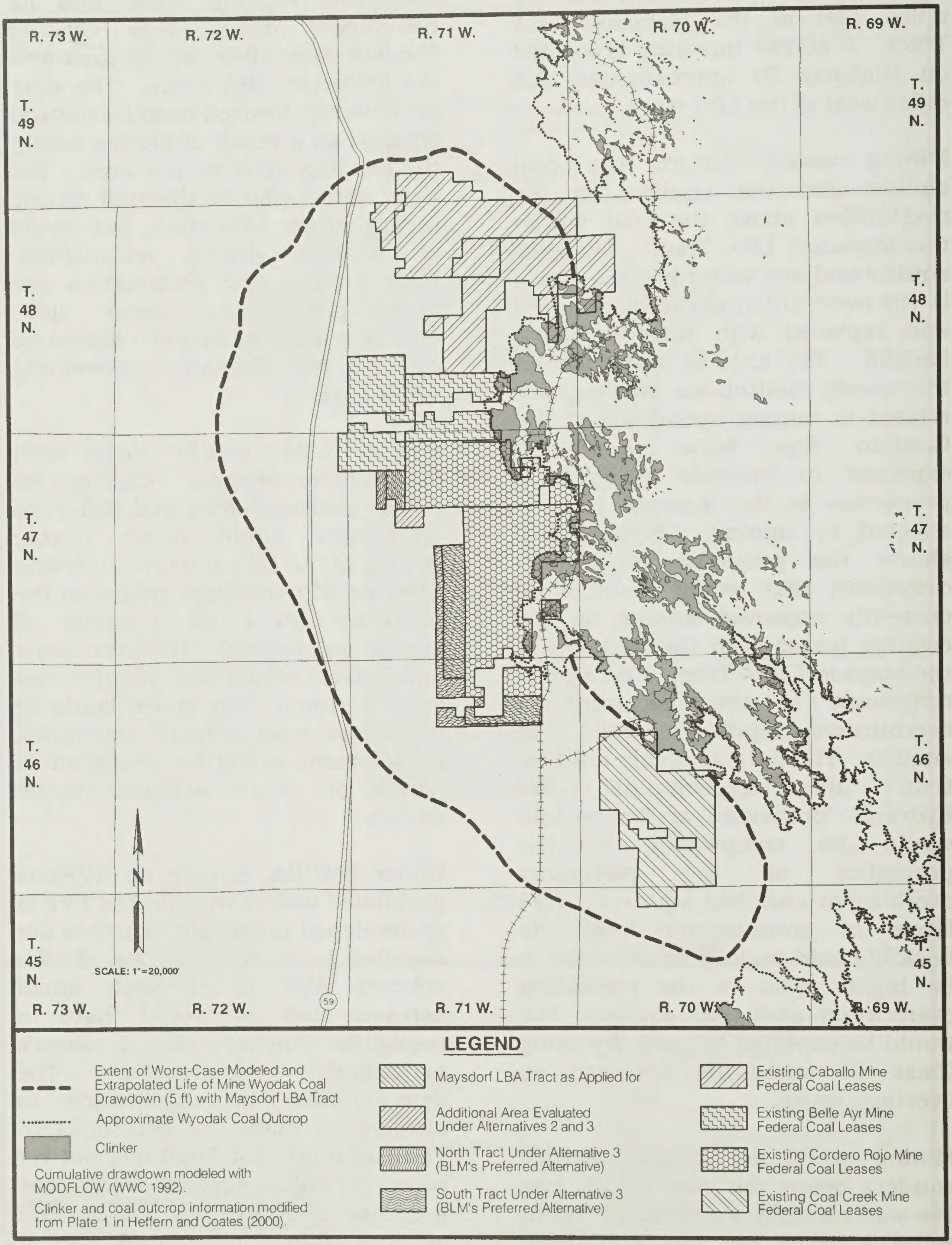

R. 73 W.
R. 72 W.
R. 71 W.
R. 70 W.
R. 69 W.
T. 49 N.
T. 48 N.
T. 47 N.
T. 46 N.
T. 45 N.
N
SCALE: 1"=20,000'
59
LEGEND
Extent of Worst-Case Modeled and Extrapolated Life of Mine Wyodak Coal Drawdown (5 ft) with Maysdorf LBA Tract
Approximate Wyodak Coal Outcrop
Clinker
Cumulative drawdown modeled with MODFLOW (WWC 1992).
Clinker and coal outcrop information modified from Plate 1 in Heffern and Coates (2000).
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
Existing Caballo Mine Federal Coal Leases
Existing Belle Ayr Mine Federal Coal Leases
Existing Cordero Rojo Mine Federal Coal Leases
Existing Coal Creek Mine Federal Coal Leases

Figure ES-4. Life of Mine Drawdown Map, Resulting from Currently Approved Mining With Addition of the Maysdorf LBA Tract.

to be considered significant to agriculture. AVFs that are not significant to agriculture can be disturbed during mining but must be restored as part of the reclamation process.

Existing wetlands located in the LBA tract would be destroyed by mining operations. Wetland inventories have been completed on the Maysdorf LBA Tract under all the alternatives and an adjacent disturbance buffer. A total of 30 acres of jurisdictional wetlands, located along the banks of the Belle Fourche River channel and at intermittent locations in upland swale drainages adjacent to the river, have been identified. Jurisdictional wetlands are defined as those wetlands that are within the extent of COE regulatory review. Restoration of at least equal types and number of any jurisdictional wetlands that are disturbed by mining is required during the reclamation process.

There would be changes in the physical, biological, and chemical properties of the soils that are removed and stockpiled prior to coal removal and replaced during reclamation. Following reclamation, the soils would be unlike premining soils in texture, structure, color, accumulation of clays, organic matter, microbial populations, and chemical composition. The replaced topsoil would be more uniform in type, thickness, and texture. It would be adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

The predominant vegetation types on the LBA tract, in terms of total acres of occurrence in the vegetation analysis area, are the sagebrush grassland (54.94 percent) and sandy grassland (32.40 percent). Mining would progressively remove this native vegetation. Reclamation and revegetation of mined areas would occur contemporaneously with mining on adjacent lands. Reestablished vegetation would be dominated by species mandated in the reclamation seed mixtures, which are approved by the WDEQ/LQD. The majority of these species would be native to the LBA tract. Initially, the reclaimed land would be dominated by grassland vegetation, which would be less diverse than the premining vegetation. Estimates for the time it would take to restore sagebrush to premining density levels range from 20 to 100 years. An indirect long-term impact associated with this vegetative change would potentially be a decrease in available habitat for shrub dependent species. However, a diverse, productive, and permanent vegetative cover would be established on the LBA tract within about 10 years following reclamation, prior to release of the final reclamation bond. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land uses (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. The reclamation plans for the LBA tract would also include steps to control invasion by weedy (invasive, nonnative) plant species.

Direct impacts of surface coal mining on wildlife occur during mining and are short term. They include road kills by mine-related traffic, direct losses of less mobile wildlife species, restrictions on wildlife movement created by fences, spoil piles and pits, displacement of wildlife from existing habitat in areas of active mining (including abandonment of nests or nesting and breeding habitat for birds), increased competition between animals in areas adjacent to mining operations, and increased noise, dust, and human presence. Habitat for aquatic species would also be lost during mining operations. Indirect impacts are longer term and include alterations in topography and vegetative cover following reclamation, which may decrease wildlife carrying capacity and habitat diversity. The Maysdorf LBA Tract does not include any unique or crucial big game habitat, and habitat disturbance would be incremental, with reclamation progressing as new disturbance occurs. In the long term, following reclamation, carrying capacity and habitat diversity may be reduced due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

T&E plant and animal species that could be present on the tract include the Ute ladies'-tresses orchid, bald eagle, and black-footed ferret. Areas of suitable habitat for the Ute ladies'-tresses orchid within the Maysdorf LBA Tract and adjacent study area were surveyed in August of 2005 and again in August of 2006, and no individuals were located. Bald eagles are relatively common winter residents and migrants in northeastern Wyoming's PRB. In the winters of 2004-2005 and 2005-2006, the bald eagle was far more common and abundant in the area than in previous years and frequently used a large windbreak within the existing Cordero Rojo Mine permit area. When the eagles began congregating, mining operations were taking place less than ¼-mile away on an existing federal coal lease. T-7 and Hilight Roads are located within 200 yards north and east of the windbreak, respectively. The Maysdorf LBA Tract adjoins Hilight Road to the west of the windbreak, but there are no trees on the tract. The windbreak used by the eagles is located in an area that is permitted to be mined. Mining operations are scheduled to begin in 2010, but topsoil removal would take place prior to 2010. No known nest sites, or consistent yearly concentrated prey or carrion sources for bald eagles are present in the area of the Cordero Rojo Mine, including the Maysdorf LBA Tract and adjacent study area. Bald eagle foraging habitat would be lost on the tract during mining and before final reclamation. The black-footed ferret is a nocturnally active mammal that depends almost entirely upon the prairie dog for its survival. No prairie dog colonies are currently present on or within two miles of the Maysdorf LBA Tract as proposed and the area added by Alternatives 2 or 3.

Active mining would preclude other land uses. Recreational and grazing use of the LBA tract would be severely limited during mining. Oil and gas development would be curtailed and CBNG that is not recovered prior to mining would be vented and irretrievably lost as the coal is removed. There are approximately 132 acres of BLM-administered public surface lands included in the Maysdorf LBA Tract as applied for and approximately 408 acres of BLM-administered public surface under Alternatives 2 and 3, but only about 164 acres of the public surface are currently accessible to the public under any of the alternatives. Within 10 years after initiation of each reclamation phase, rangeland and wildlife use would return to near premining levels. The cumulative impacts of energy development (coal mining, oil and gas) in the PRB are and will continue to contribute to a reduction in hunting opportunities for some animals (pronghorn, mule deer, and sage grouse).

The Maysdorf LBA Tract has been surveyed for cultural resources at the Class III level. A total of 39 archeological sites were identified in the Maysdorf LBA Tract cultural survey area. Three historic trails and one prehistoric open camp are the only sites that were considered eligible for the NRHP by the cultural site recorder. Until consultation with SHPO has occurred and agreement regarding NRHP eligibility has been reached, all sites would be protected from disturbance.

No sites of Native American religious or cultural importance have been identified on the LBA tract. Two tribes have expressed concerns or requested additional information, but have not identified specific sites that are of concern to their tribes at this time. If such sites or localities are identified at a later date, appropriate action must be taken to address concerns related to those sites.

Mining activities on the Maysdorf LBA Tract would be visible from Wyoming Highway 59 and several county roads. Mining would affect landscapes classified by BLM as VRM Class V, and the landscape character would not be significantly changed following reclamation. No unique visual resources have been identified on or near the LBA tract.

Impacts from noise generated by mining activities on the Maysdorf LBA Tract are not expected to be significant due to the remote nature of the site. The nearest occupied dwelling is located more than one mile from the western edge of the tract and no major noise impacts are expected for this dwelling.

Leasing the Maysdorf LBA Tract would extend the length of time that coal is shipped from the permitted Cordero Rojo Mine, which would extend the length of time that coal transportation facilities would be required under the Proposed Action or Alternatives 2 or 3. Vehicular traffic to and from the mine would continue for up to nine additional years. The mine is currently evaluating options to relocate several county roads in order to recover the coal in existing leases. Active pipelines and utility lines would have to be relocated in accordance with previous agreements, or agreements would have to be negotiated for their removal or relocation.

Royalty and bonus payments for the coal in the LBA tract would be collected by the federal government and split with the state. Assuming an average coal price of $5.80 per ton recovered and a potential range of bonus payments of 30 to 97 cents per ton, the potential additional federal revenues would range from approximately $201 to $408 million, depending on the alternative selected and the bonus price at the time the coal is leased. Potential additional revenue to the state would range from approximately $279 to $523 million. Mine life, and thus employment, would be extended from six to nine years at the Cordero Rojo Mine.

With regard to Environmental Justice issues, it was determined that potentially adverse impacts do not disproportionately affect minorities, low-income groups or Native American tribes or groups. No tribal lands or Native American communities are included in this area, and no Native American treaty rights or Native American trust resources are known to exist for this area.

Under the No Action Alternative, the coal lease application would be rejected and the area contained in the application would not be offered for lease at this time. The tract could be nominated for lease again in the future. Under the No Action Alternative, the impacts described in the preceding paragraphs to topography and physiology, geology and minerals, soils, air quality, water resources, AVFs, wetlands, vegetation, wildlife, T&E species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would occur on the existing Cordero Rojo Mine coal leases, but these impacts would not be extended onto the Maysdorf LBA Tract. Portions of the LBA tract adjacent to the existing Cordero Rojo or Belle Ayr Mines would be disturbed to recover the coal in the existing leases.

If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, BLM can include additional mitigation measures, in the form of stipulations on the new lease, within the limits of its regulatory authority. BLM has not identified additional special stipulations that should be added to the BLM lease or areas where additional or increased monitoring measures are recommended.

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

Since decertification of the Powder River Federal Coal Region in 1990, 17 coal leases containing more than five billion tons of federal coal have been issued following competitive sealed-bid sales. Three exchanges of federal coal in the Wyoming portion of the Powder River Federal Coal Region have also been completed. Twelve additional coal lease applications, including the Maysdorf application, are currently pending. The pending LBA applications contain approximately 4.4 billion tons of coal.

BLM is completing a regional technical study, called the PRB Coal Review, to help evaluate the cumulative impacts of coal and other mineral development in the PRB. The PRB Coal Review evaluates current conditions as of a baseline year (2003) and potential cumulative impacts related to projected coal and coal-related development, oil and gas and oil- and gas-related development, and other development for 2010, 2015, and 2020. Due to variables associated with future coal production, two projected coal production scenarios (representing an upper and a lower production level) were developed. The projected development levels are based on projected demand and coal market forecasts and include production at the Cordero Rojo Mine during the baseline year and projected production for the mine for 2010, 2015, and 2020.

The Wyoming portion of the PRB is the primary focus of the PRB Coal Review, but the Montana portion of the PRB is included in some studies. A series of reports has been prepared or are being prepared to present the result of the PRB Coal Review studies. The results of the PRB Coal Review studies that have been completed are summarized in Section 4.0 of this EIS.

Cumulative impacts vary by resource, with potential impacts to air quality, groundwater quantity, wildlife habitat, and socioeconomics generally being the greatest concerns.

The PRB Coal Review air quality study documents the modeled air quality impact of existing operations and projected development activities. The model was used to evaluate impacts of operations during a baseline year (2002) and projected (year 2010) source emissions on several source groups, including near-field receptors in Wyoming and Montana, receptors in nearby federally designated “Class I” areas, and receptors at “Class II” sensitive areas. The EPA guideline CALPUFF model system was used for the modeling analysis.

The existing regional air quality conditions are generally very good. There are limited air pollution emissions sources (few industrial facilities, including the surface coal mines, and few residential emissions in relatively small communities and isolated ranches) and good atmospheric dispersion conditions. The modeling for 2002 and 2010 showed some substantial impacts at several receptors. Table ES-2 presents the maximum modeled impacts on ambient air quality at the near-field receptors in Wyoming and Montana for 2002 and for the 2010 upper and lower coal development scenarios. Table ES-3 lists the projected modeled visibility impacts for 2002 for all analyzed Class I and sensitive Class II areas. For the upper and lower coal production scenarios, it shows the number of additional days that the projected impacts were greater than 1.0 dv (10 percent in extinction) for each site in 2010.

Table ES-2. Projected Maximum Potential Near-field Impacts (μg/m^3).

Pollutant	Averaging Time	Base Year (2002) Impacts	2010 Lower Development Scenario Impacts	2010 Upper Development Scenario Impacts	NAAQS	Wyoming AAQS	Montana AAQS	PSD Class II Increments
Wyoming Near-field								
NO_2	Annual	37.3	42.4	49.0	100	100	--[1]	25
SO_2	Annual	3.9	4.8	5.6	80	60	--[1]	20
	24-hour	14.5	33.5	34.8	365	260	--[1]	91
	3-hour	37.9	148.0	154.2	1,300	1,300	--[1]	512
PM_{10}	Annual	42.7	49.0	**56.6**	--[2]	50	--[1]	17
	24-hour	**335.5**	**378.8**	**439.9**	150	150	--[1]	30
Montana Near-field								
NO_2	Annual	8.85	11.3	11.8	100	--[1]	100	25
	1-hour	365.8	415.9	519.5	--	--[1]	564	--
SO_2	Annual	1.3	2.3	2.7	80	--[1]	80	20
	24-hour	18.9	19.5	20.4	365	--[1]	365	91
	3-hour	74.7	76.4	79.8	1,300	--[1]	1,300	512
	1-hour	240.7	246.4	257.3	--	--[1]	1,300	--
PM_{10}	Annual	19.6	22.5	27.7	--[2]	--[1]	50	17
	24-hour	**175.8**	**200.0**	**247.7**	150	--[1]	150	30

1 No standard or increment.

2 On September 21, 2006, the EPA announced final revisions to the NAAQS for particulate matter, which took effect December 18, 2006. The revision revoked the annual PM_{10} standard of 50 μg/m^3. The revisions retained the 24-hour PM_{10} standard. The State of Wyoming will enter into rulemaking to revise the Wyoming Ambient Air Quality Standards. See additional discussion in Chapter 3, Section 3.4.2.1.

Bold values indicate exceedance of AAQS.

Source: PRB Coal Review Task 3A Report (BLM 2006b)

Table ES-3. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas.

Location	2002 No. of Days >10%	2010 Lower Development Scenario Change in No. of Days > 10%	2010 Upper Development Scenario Change in No. of Days > 10%
Federally and Tribally Designated Class I Areas			
Badlands National Park	238	19	26
Bob Marshall WA	12	2	4
Bridger WA	47	4	7
Fitzpatrick WA	42	3	5
Fort Peck Indian Reservation	69	8	9
Gates of the Mountain WA	14	6	7
Grand Teton National Park	26	2	5
North Absaroka WA	47	6	6
North Cheyenne Indian Reservation	305	5	10
Red Rock Lakes	16	3	5
Scapegoat WA	14	4	4
Teton WA	40	4	5
Theodore Roosevelt National Park	98	15	22
UL Bend WA	49	4	5
Washakie WA	53	2	3
Wind Cave National Park	261	11	15
Yellowstone National Park	42	7	8
Sensitive Class II Areas			
Absaroka Beartooth WA	53	3	5
Agate Fossil Beds National Monument	199	26	30
Big Horn Canyon National Rec. Area	108	7	8
Black Elk WA	263	16	22
Cloud Peak WA	137	8	8
Crow Indian Reservation	284	10	15
Devils Tower National Monument	279	15	21
Fort Belknap Indian Reservation	46	3	4
Fort Laramie National Historic Site	153	27	30
Jedediah Smith WA	23	1	2
Jewel Cave National Monument	267	14	18
Lee Metcalf WA	25	2	4
Mount Naomi WA	8	6	8
Mount Rushmore National Monument	248	19	25
Popo Agie WA	47	7	8
Soldier Creek WA	223	23	29
Wellsville Mountain WA	6	5	7
Wind River Indian Reservation	66	12	15

Source: PRB Coal Review Task 3A Report (BLM 2006b)

The PRB Coal Review groundwater study is in progress, but a number of modeling analyses have previously been conducted to help predict the impacts of surface coal mining on groundwater resources in the PRB. In addition, each mine must monitor groundwater levels in the coal and underlying and overlying aquifers and assess the probable hydrologic consequences of mining as part of the mine permitting process. The monitoring programs track the extent of groundwater drawdown propagation to the west and the extent of recharge and quality of the water in the backfill areas of the mines. The monitoring data indicate that recharge is occurring in the backfill and that water from the backfill will generally be acceptable for premining uses (primarily livestock watering). Modeling and monitoring indicate that the groundwater drawdown impacts of coal mining and CBNG development are overlapping.

The PRB Coal Review studies include an evaluation of the impacts to wildlife and aquatic species as of 2003 and an evaluation of the projected levels of disturbance in the PRB in 2010, 2015, and 2020, based on the projected development levels in those year. As discussed above, impacts to wildlife and fisheries can be classified as short-term and long-term. Short-term impacts are related to habitat disturbance during project development and operation. Long-term impacts result from changes in habitat after reclamation is completed. Habitat fragmentation can result from activities such as roads, well pads, mines, pipelines, and electrical power lines, as well as increased noise, elevated human presence, dispersal of noxious and invasive weed species, and dust from unpaved road traffic.

The PRB Coal Review used the REMI Policy Insight regional economic model to project cumulative employment and population levels and associated impacts in the PRB for the upper and lower coal production scenarios in 2010, 2015, and 2020. Table ES-4 presents the recent and projected population levels for the counties included in the PRB Coal Review socioeconomic analysis.

This EIS presents the BLM's analysis of environmental impacts under authority of the NEPA and associated rules and guidelines.

The BLM will use this analysis to make a leasing decision. The decision to lease these lands is a necessary requisite for mining, but is not in itself the enabling action that will allow mining. The most detailed analysis prior to mine development would occur after the lease is issued, when the lessee files an application for a surface mining permit and mining plan approval, supported by extensive proposed mining and reclamation plans, to the WDEQ/LQD.

Table ES-4. Recent and Projected PRB Population.

Year	Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Total Study Area
				Census			
2000	33,698	12,104	5,895	7,108	26,606	6,642	92,053
2003	36,438	12,314	5,986	7,554	27,115	6,671	96,078
				Lower Coal Production Scenario			
2010	45,925	13,103	6,542	8,389	28,459	7,108	109,526
2015	48,905	13,671	6,759	8,867	30,016	7,174	115,392
2020	50,995	14,193	6,989	9,326	31,467	7,208	120,178
				Upper Coal Production Scenario			
2010	47,662	13,160	6,570	8,424	28,579	7,137	111,532
2015	51,558	13,763	6,802	8,924	30,214	7,219	118,480
2020	54,943	14,313	7,045	9,403	31,733	7,266	124,703

Source: U.S. Census Bureau 2005 (2000 and 2003 data)

1.0 INTRODUCTION

This EIS[1] analyzes the environmental impacts of leasing a tract of federal coal reserves adjacent to the Cordero Rojo Mine, an operating surface coal mine in the east-central PRB of Wyoming. CMC, the operator of the Cordero Rojo Mine, filed an application to lease the federal coal included in a maintenance coal tract under the regulations at 43 CFR 3425, Leasing On Application. The application was reviewed by BLM, Wyoming State Office, Division of Minerals and Lands, which determined that the lease application meets the regulatory requirements for a lease by application, or LBA. The tract is referred to as the Maysdorf LBA Tract. Figure 1-1 shows the Maysdorf LBA Tract as applied for by CMC, other currently pending LBA tracts, and the existing federal leases, including previously leased LBA tracts, in the Wyoming PRB.

A separate document, entitled *Supplementary Information on the Affected Environment in the General Analysis Area for the Maysdorf Coal Lease Application EIS*, has been prepared to provide more detailed information on the affected environment in the general analysis area. Copies of the supplementary information document are available on request and can be viewed at the BLM offices in Casper and Cheyenne.

1.1 Background

On September 20, 2001, CMC filed an application with the BLM for federal coal reserves in a tract located west of and immediately adjacent to the Cordero Rojo Mine in Campbell County, Wyoming, approximately 15 miles south-southeast of Gillette, Wyoming (Figure 1-1). The tract, which was originally referred to as the Mt. Logan LBA Tract, was assigned case file number WYW154432. The federal coal reserves were applied for as a maintenance tract for the Cordero Rojo Mine. The Cordero Rojo Mine is operated by CMC, a directly held subsidiary of Rio Tinto Energy America (formerly Kennecott Energy and Coal Company). CMC subsequently renamed the tract the Maysdorf LBA Tract and submitted modifications to the application to the BLM, which decreased the lease area and coal volume, on May 21, 2002; July 1, 2004; and November 8, 2004. BLM reviewed the November 2004 tract modification and notified the company by letter, dated May 20, 2005, that their application had been revised.

These federal coal lands are located within the Powder River Federal Coal Region, which was decertified in January 1990. Although the Powder River Federal Coal Region is decertified, the PRRCT, a federal/state advisory board established to develop recommendations concerning management of federal coal in the region, has continued to meet regularly and review all federal lease applications in the region. The PRRCT reviewed this maintenance

---

[1] Refer to page xv for a list of abbreviations and acronyms used in this document.

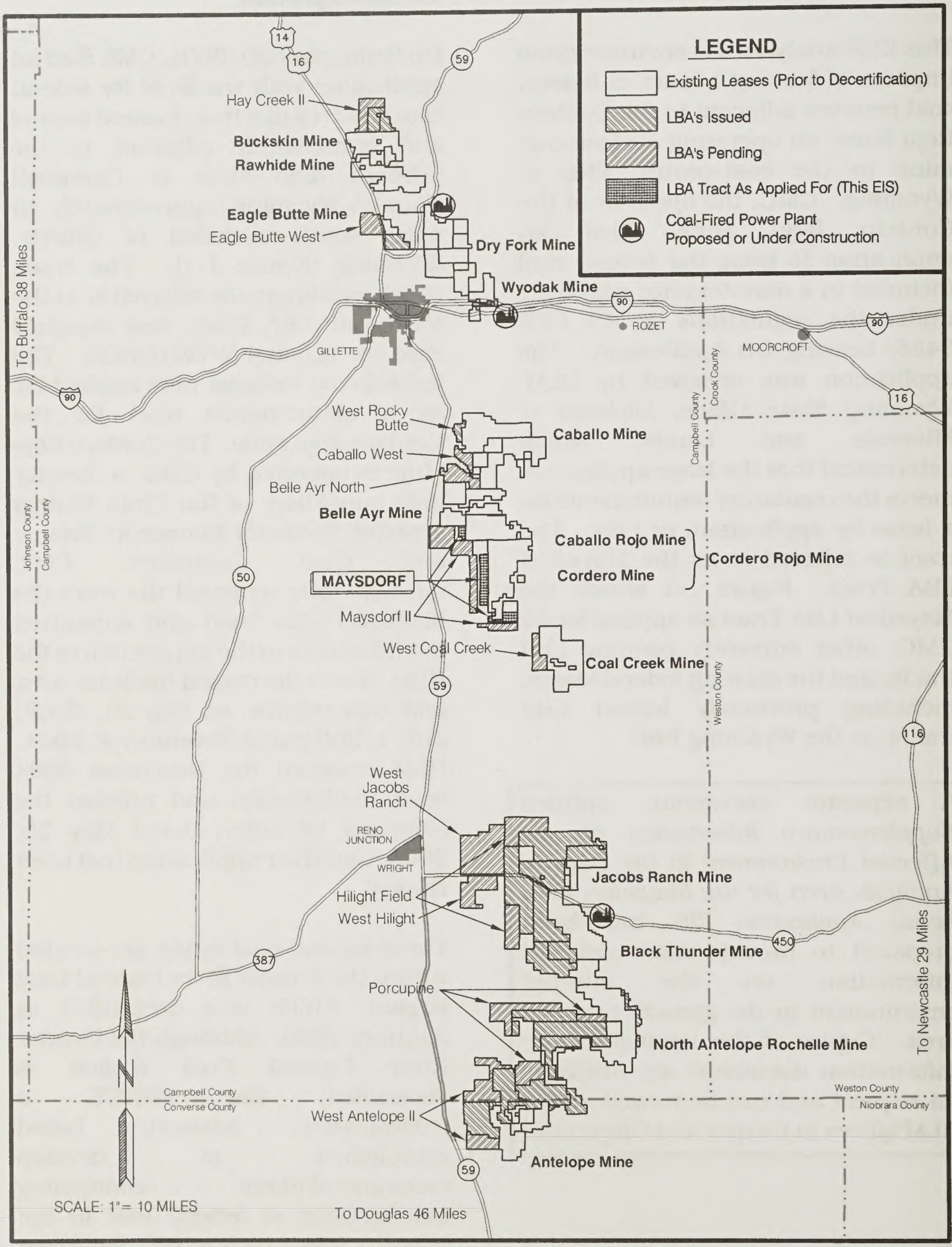

LEGEND
Existing Leases (Prior to Decertification)
LBA's Issued
LBA's Pending
LBA Tract As Applied For (This EIS)
Coal-Fired Power Plant Proposed or Under Construction
14
16
59
Hay Creek II
Buckskin Mine
Rawhide Mine
Eagle Butte Mine
Eagle Butte West
Dry Fork Mine
Wyodak Mine
90
ROZET
MOORCROFT
GILLETTE
To Buffalo 38 Miles
West Rocky Butte
Caballo West
Belle Ayr North
Belle Ayr Mine
Caballo Mine
Campbell County
Crook County
Johnson County
Campbell County
Caballo Rojo Mine
Cordero Mine
Cordero Rojo Mine
MAYSDORF
Maysdorf II
50
West Coal Creek
Coal Creek Mine
Weston County
116
West Jacobs Ranch
RENO JUNCTION
WRIGHT
Hilight Field
West Hilight
Jacobs Ranch Mine
Black Thunder Mine
450
387
To Newcastle 29 Miles
Porcupine
North Antelope Rochelle Mine
Campbell County
Converse County
Weston County
Niobrara County
West Antelope II
Antelope Mine
SCALE: 1"= 10 MILES
To Douglas 46 Miles

Figure 1-1. General Location Map with Federal Coal Leases and LBA Tracts.

coal lease application at public meetings held on May 30, 2002, in Casper, Wyoming and on April 27, 2005, in Gillette, Wyoming. The PRRCT recommended that the BLM continue to process the Maysdorf lease application at both meetings.

In order to process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal and fulfill the requirements of NEPA by evaluating the environmental impacts of leasing the federal coal. BLM does not authorize mining by issuing a lease for federal coal, but the impacts of mining the coal are considered in this EIS because it is a logical consequence of issuing a maintenance lease to an existing mine. This EIS has been prepared to evaluate the site-specific and cumulative environmental impacts of leasing and developing the federal coal included in the Maysdorf application area. BLM will use the analysis in this EIS to decide whether to hold a competitive, sealed-bid lease sale for the tract as applied for, hold a competitive, sealed-bid lease sale for a modified tract, or reject the lease application and not offer the tract for sale at this time. A Record of Decision will be issued and, if the decision is to offer the tract for lease, a sale will be held. If a sale is held, the bidding at the sale would be open to any qualified bidder; it would not be limited to the applicant.

If the lease sale is held, a lease would be issued to the highest bidder at the sale if a federal sale panel determines that the high bid meets or exceeds the fair market value of the coal as determined by BLM's economic evaluation and if the U.S. Department of Justice determines that there would be no antitrust violations if a lease is issued to the high bidder.

In return for receiving a lease, a lessee must pay the federal government a bonus equal to the amount it bids at the time the lease sale is held (the bonus can be paid in five yearly installments), make annual rental payments to the federal government, and make royalty payments to the federal government when the coal is mined. Federal bonus, rental, and royalty payments are equally divided with the state in which the lease is located.

Other agencies may use this analysis to make decisions related to leasing and mining the federal coal in this tract. OSM, WDEQ/LQD and the Wyoming State Planning Office are cooperating agencies on this EIS. OSM has primary responsibility to administer Federal programs that regulate surface coal mining operations and will use this EIS to make decisions related to the approval of the MLA mining plan if the tract is leased. WDEQ has entered into a cooperative agreement with the Secretary of the Interior to regulate surface coal mining operations on federal and non-federal lands within the State of Wyoming.

Since decertification of the Powder River Federal Coal Region, 17 federal coal leases have been sold at competitive sealed-bid sales and three exchanges of federal coal in the Wyoming portion of the Powder River Federal Coal Region have been completed (Table 1-1). This is the first application for a maintenance coal tract submitted by the Cordero Rojo Mine since decertification (Table 1-1 and Figure 1-1).

Table 1-2 summarizes the 12 lease applications that are currently pending.

The Maysdorf LBA Tract as applied for and the existing federal coal leases in the adjacent Cordero Rojo Mine are shown in Figure 1-2. As applied for, the Maysdorf LBA Tract consists of three separate blocks of federal coal and includes approximately 2,219.4 acres with an estimated 234.8 million tons of in-place coal reserves. Not all of the coal included in the Maysdorf LBA Tract is considered to be recoverable at this time. CMC estimates that approximately 4.5 million tons of the coal included in the tract are located within the BNSF & UP railroad ROW. The coal underlying the ROW is not considered to be recoverable at this time because the cost that would be associated with moving the railroad would make it economically unfeasible to recover the underlying coal. In addition, a small portion of the tract is located within a "no-coal" zone, where coal-forming sediments were either not deposited or were eroded away after deposition. The coal within the ROW that cannot be recovered and the extent of the "no-coal" zone will be considered by BLM in determining the fair market value of the federal coal included in the LBA tract. CMC estimates that approximately 230.3 million tons of in-place coal reserves are mineable and that approximately 216.48 million tons of coal would be recovered from the Maysdorf LBA Tract as applied for.

The Cordero Rojo Mine is comprised of the former Cordero Mine and the contiguous former Caballo Rojo Mine. Rio Tinto Energy America (formerly Kennecott Energy and Coal Company), the parent company of CMC (the operator of the former Cordero Mine), purchased 100 percent of the stock of CRI (the operator of the former Caballo Rojo Mine) on February 19, 1997. The CMC Mine, as currently permitted, includes 8,517 acres and originally contained approximately 593 million tons of mineable coal reserves. The CRI Mine, as currently permitted, includes 7,664 acres and originally contained approximately 493 million tons of mineable coal reserves. As of January 1, 2006, an estimated 388.1 million tons of in-place coal reserves remained at the Cordero Rojo Mine; CMC estimates that approximately 364.8 million tons of those remaining reserves would be recoverable. Cordero Rojo Mine's currently approved (by WDEQ/AQD on April 13, 2004) air quality permit allows up to 65 million tons of coal per year to be mined through year 2008. The Cordero Rojo Mine produced approximately 38.6 million tons of coal in 2000, 43.5 million tons of coal in 2001, 38.2 million tons of coal in 2002, 36.1 million tons of coal in 2003, 38.8 million tons of coal in 2004, and 37.5 million tons of coal in 2005. Cordero Rojo Mine personnel are working with the WDEQ/LQD to consolidate the CMC and CRI mining permits into a single mining permit for the Cordero Rojo Mine, which will include approximately 16,804 acres.

Table 1-1. Leases Issued and Exchanges Completed Since Decertification, Powder River Basin, Wyoming.

Leases Issued

LBA Name (Lease Number) Applicant Mine Current Lessee Effective Date	Acres Leased[1]	Mineable Tons of Coal[1]	Successful Bid
Jacobs Ranch LBA (WYW117924) Jacobs Ranch Mine Jacobs Ranch Coal Co. 10/1/1992	1,708.620	147,423,560	$20,114,930.00
West Black Thunder LBA (WYW118907) Black Thunder Mine Thunder Basin Coal Co. 10/1/1992	3,492.495	429,048,216	$71,909,282.69
North Antelope/Rochelle LBA (WYW119554) North Antelope & Rochelle Mines Powder River Coal Co. 10/1/1992	3,064.040	403,500,000	$86,987,765.00
West Rocky Butte LBA (WYW122586) No Existing Mine[2] Caballo Coal Co. 1/1/1993	463.205	56,700,000	$16,500,000.00
Eagle Butte LBA (WYW124783) Eagle Butte Mine Foundation Wyoming Land Co. 8/1/1995	1,059.180	166,400,000	$18,470,400.00
Antelope LBA (WYW128322) Antelope Mine Antelope Coal Co. 2/1/1997	617.200	60,364,000	$9,054,600.00
North Rochelle LBA (WYW127221) North Rochelle Mine Ark Land Co. 1/1/1998	1,481.930	157,610,000	$30,576,340.00
Powder River LBA (WYW136142) North Antelope Rochelle Mine Powder River Coal Co. 9/1/1998	4,224.225	532,000,000	$109,596,500.00
Thundercloud LBA (WYW136458) Jacobs Ranch Mine Thunder Basin Coal Co., LLC 1/1/1999	3,545.503	412,000,000	$158,000,008.50
Horse Creek LBA (WYW141435) Antelope Mine Antelope Coal Co. 12/1/2000	2,818.695	275,577,000	$91,220,120.70
North Jacobs Ranch LBA (WYW146744) Jacobs Ranch Mine Jacobs Ranch Coal Co. 5/1/2002	4,982.240	537,542,000	$379,504,652.00

Table 1-1. Leases Issued and Exchanges Completed Since Decertification, Powder River Basin, Wyoming (Continued).

LBA Name (Lease Number) Applicant Mine Current Lessee Effective Date	Acres Leased[1]	Mineable Tons of Coal[1]	Successful Bid
NARO South LBA (WYW154001) North Antelope Rochelle Mine BTU Western Resources, Inc. 9/1/2004	2,956.725	297,469,000	$274,117,684.00
West Hay Creek LBA (WYW151634) Buckskin Mine Kiewit Mining Properties, Inc. 1/1/2005	921.158	142,698,000	$42,809,400.00
Little Thunder LBA (WYW150318) Black Thunder Mine Ark Land LT Co. 3/1/2005	5,083.500	718,719,000	$610,999,949.80
West Antelope LBA (WYW151643) Antelope Mine Antelope Coal Co. 3/1/2005	2,809.130	194,961,000	$146,311,000.00
NARO North LBA (WYW150210) North Antelope Rochelle Mine BTU Western Resources, Inc. 3/1/2005	2,369.380	324,627,000	$299,143,785.00
West Roundup LBA (WYW151134) North Rochelle Mine West Roundup Resources, Inc 5/1/2005	2,812.51	327,186,000	$317,697,610.00
TOTALS	**44,409.731**	**5,183,824,776**	**$2,683,014,027.69**

Exchanges Completed

Exchange Name Case File Number Exchange Proponent Exchange Type Effective Date	Acres Exchanged	Mineable Tons of Coal	Federal Coal Exchanged for:
EOG (Belco) I-90 Lease Exchange WYW150152 EOG Resources (formerly Belco)[3] I-90 Lease Exchanged for New Lease 4/1/2000	599.170	106,000,000	Lease Rights to Belco I-90 Lease (WYW0322794)
Pittsburg & Midway Coal Exchange WYW148816 Pittsburg and Midway Coal Mining Co. Private Land Exchanged for Federal Coal 1/27/2005	2,045.530	84,200,000	6,065.77 acres of land and some minerals in Lincoln, Carbon, and Sheridan Counties, Wyoming.
Gold Mine Draw Lease Exchange WYW0321779, WYW154001 Powder River Coal Co. AVF Lease Exchanged for New Lease 6/25/2006	623.000	47,700,000	Lease rights to 921.60 acres of leased federal coal underlying an AVF.
TOTALS	**3,267.700**	**237,900,000**	

---

[1] Information from Sale Notice.

[2] The West Rocky Butte LBA was originally leased to Northwestern Resources Co.

[3] The EOG Resources Belco Exchange lease is now owned by the Buckskin Mine.

Table 1-2. Pending LBAs and Exchanges, Powder River Basin, Wyoming.

Pending LBAs				
LBA Name **Lease Number** **Applicant Mine**	**Application Date**	**Acres as Applied for**	**Estimated as Applied for Coal (mmt)**	**Status**
Maysdorf **(formerly Mt. Logan)** WYW154432 Cordero Rojo	9/20/2001 Modified 11/8/2004	2,219.39	230.30[1]	PRRCT reviewed 5/30/2002 & 4/27/2005 FEIS in review
Eagle Butte West **(formerly West Extension)** WYW155132 Eagle Butte	12/28/2001 Modified 10/16/2003	1,397.64	228.00[2]	PRRCT reviewed 5/30/2002 & 4/27/2005 FEIS in preparation
Belle Ayr North WYW161248 Belle Ayr	7/06/2004	1,578.76	200.00[2]	PRRCT reviewed 4/27/2005
West Antelope II WYW163340 Antelope	4/06/2005	4,108.60	429.70[3]	PRRCT reviewed 4/27/2005
Hilight Field WYW164812 Black Thunder	10/07/2005	4,590.19	588.20[2]	PRRCT reviewed 4/19/2006
West Hilight Field WYW172388 Black Thunder	1/17/2006	2,370.52	428.00[2]	PRRCT reviewed 4/19/2006
West Coal Creek WYW172585 Coal Creek	2/10/2006	1,151.26	57.00[2]	PRRCT reviewed 4/19/2006
Caballo West WYW172657 Caballo	3/15/2006	777.48	87.52[1]	PRRCT reviewed 4/19/2006
West Jacobs Ranch WYW172685 Jacobs Ranch	3/24/2006	5,944.37	956.00[3]	PRRCT reviewed 4/19/2006
Hay Creek II WYW172684 Buckskin	3/24/2006	1,447.00	148.00[1]	PRRCT reviewed 4/19/2006
Maysdorf II WYW173360 Cordero Rojo	9/1/2006	4,653.840	483.00[3]	PRRCT reviewed 1/18/2007
Porcupine WYW173408 North Antelope Rochelle	9/29/2006	5,111.390	598.00[1]	PRRCT reviewed 1/18/2007
TOTALS		**35,350.44**	**4,433.72**	

---

[1] Estimated tons of mineable coal as reported in the lease application.
[2] Estimated tons of recoverable coal as reported by the applicant.
[3] Estimated tons of in-place coal as reported in the lease application.

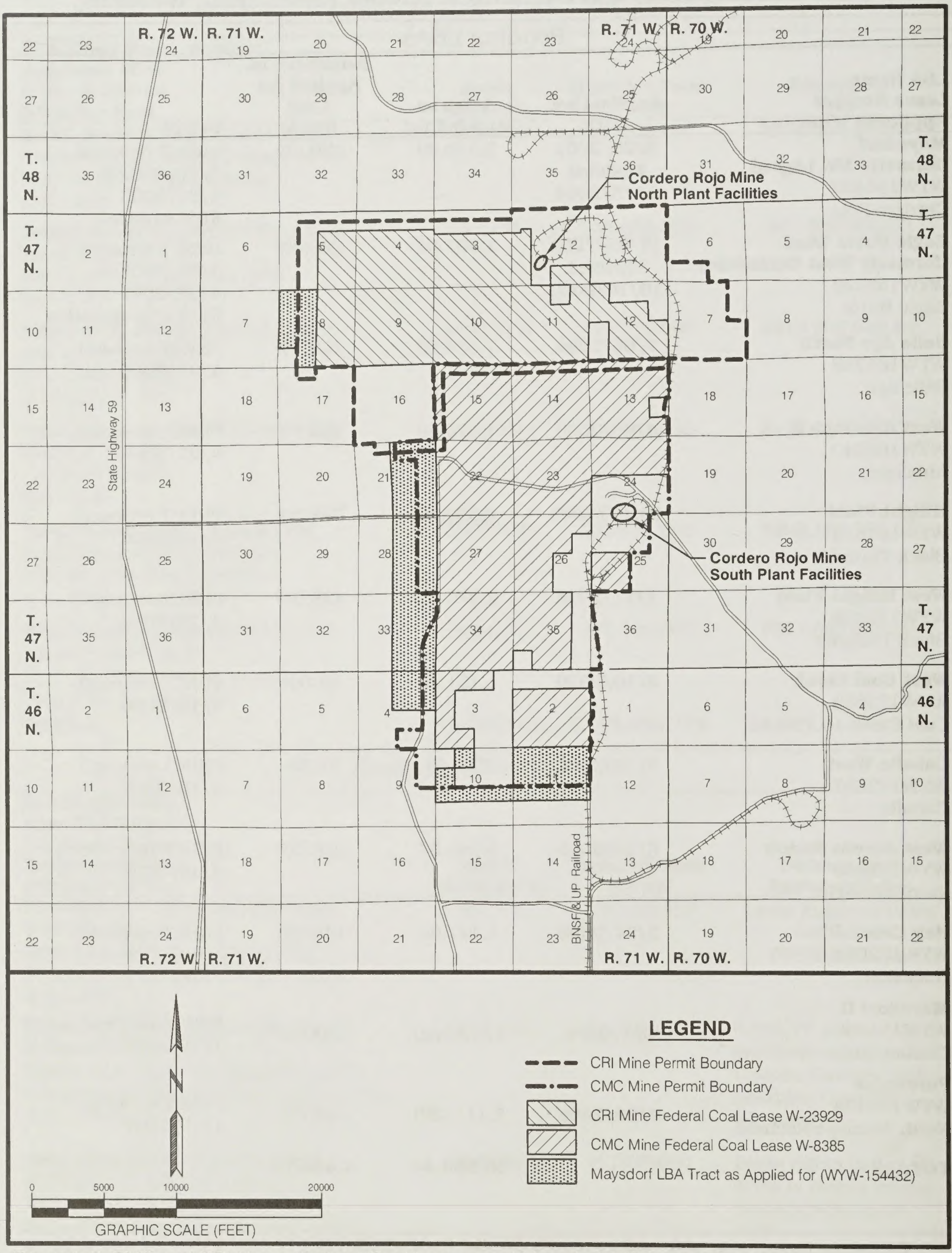

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
22 23 24 19 20 21 22 23 24 19 20 21 22
27 26 25 30 29 28 27 26 25 30 29 28 27
35 36 31 32 33 34 35 36 31 32 33
2 1 6 5 4 3 2 1 6 5 4
10 11 12 7 8 9 10 11 12 7 8 9 10
15 14 13 18 17 16 15 14 13 18 17 16 15
22 23 24 19 20 21 22 23 24 19 20 21 22
27 26 25 30 29 28 27 26 25 30 29 28 27
35 36 31 32 33 34 35 36 31 32 33
2 1 6 5 4 3 2 1 6 5 4
10 11 12 7 8 9 10 11 12 7 8 9 10
15 14 13 18 17 16 15 14 13 18 17 16 15
22 23 24 19 20 21 22 23 24 19 20 21 22
Cordero Rojo Mine North Plant Facilities
Cordero Rojo Mine South Plant Facilities
State Highway 59
BNSF & UP Railroad
N
0
5000
10000
20000
GRAPHIC SCALE (FEET)
LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
▨ CRI Mine Federal Coal Lease W-23929
▨ CMC Mine Federal Coal Lease W-8385
▒ Maysdorf LBA Tract as Applied for (WYW-154432)

Figure 1-2. CMC and CRI Mines' Federal Coal Leases and Maysdorf LBA Tract as Applied for.

As discussed above, the Maysdorf LBA Tract as applied for consists of three separate blocks. The northern block is contiguous with both the Cordero Rojo Mine and the Belle Ayr Mine, owned by Foundation Coal West, Inc. (Figure 1-1). The central and southern blocks are contiguous with only the Cordero Rojo Mine. Portions of all three blocks lie within the current mining permit boundaries of the CMC and CRI Mines (Figure 1-2). The area applied for is substantially similar to areas included in the adjacent mines, for which detailed site-specific environmental data have been collected and for which environmental analyses have previously been prepared to secure the existing leases and necessary mining permits.

The surface of the Maysdorf LBA Tract is owned by the United States of America; CMC; CRI; Barbara and Christopher Stock; the Bruce Haight and Jilliane Haight Trusts; Leslie and Sandra Haight, et al.; the Norma Duvall Trust; and Foundation Wyoming Land Company. The federally-owned surface is administered by the BLM. Leslie and Sandra Haight, et al. includes Bruce and Jilliane Haight, Barbara and Christopher Stock, Mark and Deena Haight, and Rio Tinto, who jointly own one tract of land included in the lease application area. See Chapter 3, Section 3.11 for additional information about surface ownership in the tract.

Current land uses of the tract include grazing by domestic animals and wildlife, and oil and gas production.

The mining method would be a combination of truck and shovel and dragline, which are the mining methods currently in use at this mine. The coal would be used primarily for electric power generation.

After mining, the land would be reclaimed to a rangeland function suitable for use by livestock and wildlife as is the current practice at the Cordero Rojo Mine. Industrial postmining land uses, which include, but are not limited to, oil wells, pipelines, roads, and utility easements, will also be reestablished as required.

1.2 Purpose and Need for Action

BLM administers the federal coal leasing program under the Mineral Leasing Act of 1920. A federal coal lease grants the lessee the exclusive right to obtain a mining permit for, and to mine coal on, the leased tract subject to the terms of the lease, the mining permit, and applicable state and federal laws. Before a new lease can be mined, the lessee must obtain approval of a detailed mining and reclamation plan.

This EIS is being prepared in response to an application BLM received from an existing mine, the Cordero Rojo Mine, to lease a tract of federal coal in the Wyoming PRB. In response to this coal lease application, the BLM must decide whether to hold a competitive, sealed-bid lease sale for the tract as applied for, hold a competitive sealed-bid lease sale for a modified tract, or reject the current lease application and not offer the tract for sale at this time.

CMC has applied for the coal reserves in the Maysdorf LBA Tract in order to extend the life of the Cordero Rojo Mine. Based upon the current projected annual coal production over the life of the mine, the applicant currently estimates that the existing recoverable reserves at the Cordero Rojo Mine will be depleted within approximately nine years at an average production rate of approximately 40 mmtpy. According to the most recent information from CMC, beginning year 2006, the Cordero Rojo Mine plans to produce an average of approximately 40 mmtpy for 15 years, if they acquire a lease for the Maysdorf LBA Tract. Thus, acquiring the new lease would enable the mine to increase its productive life by six years. If the LBA tract is leased to the applicant as a maintenance tract, the mining and reclamation permit for the adjacent Cordero Rojo Mine would have to be amended to include the new lease area before it could be disturbed. This process takes several years to complete. CMC is applying for federal coal reserves now so that they can negotiate new contracts and then complete the permitting process in time to meet anticipated new contract requirements.

As discussed above, the purpose of CMC's application is to allow the Cordero Rojo Mine access to a continuing supply of low sulfur compliance coal, which it can continue to sell to power plants for the purpose of electric power generation. Continued leasing of PRB coal enables coal-fired power plants to meet CAA requirements without constructing new plants, revamping existing plants, or switching to existing alternative fuels, which would probably significantly increase power costs for individuals and businesses.

A primary goal of the National Energy Policy is to add energy supplies from diverse sources, including domestic oil, gas, and coal, as well as hydropower and nuclear power. BLM recognizes that the continued extraction of coal is essential to meet the nation's future energy needs. As a result, private development of federal coal reserves is integral to the BLM coal leasing program under the authority of the MLA, as well as FLPMA and FCLAA. The coal leasing program, managed by BLM, encourages the development of domestic coal reserves and reduction of the U.S. dependence on foreign sources of energy. As a result of the leasing and subsequent mining and sale of federal coal resources in the PRB, the public receives lease bonus payments, lease royalty payments, and a reliable supply of low sulfur coal for power generation.

This EIS analyzes the environmental impacts of issuing a federal coal lease and mining the federal coal in the Maysdorf maintenance coal lease application as required by NEPA and associated rules and guidelines. A decision to hold a competitive sale and issue a lease for the lands in this application is a prerequisite for mining but it is not the enabling action that would allow mining to begin. The BLM does not authorize mining operations by issuing a lease. After a lease has been issued but prior to mine development, the lessee must file a permit application package with the WDEQ/LQD and OSM for a surface mining permit and approval of the MLA mining plan. An analysis of a detailed site-specific mining and reclamation plan occurs at that time. Authorities and responsibilities of the BLM and other concerned regulatory agencies are described in the following sections.

1.3 Regulatory Authority and Responsibility

The Maysdorf maintenance coal lease application was submitted and will be processed and evaluated under the following federal authorities:

- MLA, as amended;
- Multiple-Use Sustained Yield Act of 1960;
- NEPA;
- FCLAA;
- FLPMA; and
- SMCRA.

The BLM is the lead agency responsible for leasing federal coal lands under the MLA as amended by FCLAA and is also responsible for preparation of this EIS to evaluate the potential environmental impacts of issuing a coal lease.

OSM is a cooperating agency on this EIS. After a federal coal lease is issued, SMCRA gives OSM primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations. WDEQ is also a cooperating agency on this EIS. Pursuant to Section 503 of SMCRA, the WDEQ developed, and in November 1980 the Secretary of the Interior approved, a permanent program authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on nonfederal lands within the State of Wyoming. In January 1987, pursuant to Section 523(c) of SMCRA, WDEQ entered into a cooperative agreement with the Secretary of the Interior authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on federal lands within the state.

Pursuant to the cooperative agreement, a federal coal lease holder in Wyoming must submit a permit application package to OSM and WDEQ/LQD for any proposed coal mining and reclamation operations on federal lands in the state. WDEQ/LQD reviews the permit application package to insure the permit application complies with the permitting requirements and the proposed coal mining operation meets the performance standards of the approved Wyoming program. OSM, BLM, and other federal agencies review the permit application package to insure it complies with the terms of the coal lease, the MLA, NEPA, and other federal laws and their attendant regulations. If the permit application package does comply, WDEQ issues the applicant a permit to conduct coal mining operations. OSM recommends approval, approval with conditions, or disapproval of the MLA mining plan to the Assistant Secretary of the Interior, Land and Minerals Management. Before the

MLA mining plan can be approved, the BLM must concur with this recommendation.

If a proposed LBA tract is leased to an existing mine, the lessee is required to revise its coal mining permit prior to mining the newly-leased coal, following the processes outlined above. As a part of that process, a detailed new plan would be developed showing how the newly-leased lands would be mined and reclaimed. The area of mining disturbance would be larger than the newly-leased area to allow for activities such as overstripping, matching reclaimed topography to undisturbed topography, constructing flood control and sediment control facilities, and related activities. Specific impacts that would occur during the mining and reclamation of the LBA tract would be addressed in the mining and reclamation plan, and specific mitigation measures for anticipated impacts would be described in detail at that time.

WDEQ enforces the performance standards and permit requirements for reclamation during a mine's operation and has primary authority in environmental emergencies. OSM retains oversight responsibility for this enforcement. Where federal surface or coal resources are involved, BLM has authority in emergency situations if WDEQ or OSM cannot act before environmental harm and damage occurs. In preparing this EIS, BLM also has a responsibility to consult with and obtain the comments and assistance of other state and federal agencies that have jurisdiction by law or special expertise with respect to potential environmental impacts.

Appendix A presents other federal and state permitting requirements that must be satisfied to mine this LBA tract.

1.4 Relationship to BLM Policies, Plans, and Programs

In addition to the federal acts listed under Section 1.3, guidance and regulations for managing and administering public lands, including the federal coal lands in the CMC application, are set forth in 40 CFR 1500 (Protection of Environment), 43 CFR 1601 (Planning, Programming, Budgeting), and 43 CFR 3400 (Coal Management).

Specific guidance for processing applications is provided by BLM Manual 3420, Competitive Coal Leasing (BLM 1989) and the 1991 *Powder River Regional Coal Team Operational Guidelines For Coal Lease-By-Applications* (BLM 1991). The *National Environmental Policy Act Handbook* (BLM 1988) has been followed in developing this EIS.

1.5 Conformance with Existing Land Use Plans

FCLAA requires that lands considered for leasing be included in a comprehensive land use plan and that leasing decisions be compatible with that plan. The BLM *Approved Resource Management Plan for Public Lands Administered by the Bureau of Land Management Buffalo Field Office* (BLM 2001a) [an update of the *Buffalo Resource Area Resource Management*

Plan (BLM 1985)] governs and addresses the leasing of federal coal in Campbell County.

The major land use planning decision that BLM must make concerning the federal coal resources is a determination of which federal coal lands are acceptable for further consideration for leasing. There are four screening procedures that BLM uses to identify these coal lands. These screening procedures require BLM to:

- estimate development potential of the coal lands;
- apply the unsuitability criteria listed in the regulations at 43 CFR 3461;
- make multiple land use decisions that eliminate federal coal deposits from consideration for leasing to protect other resource values; and
- consult with surface owners who meet the criteria defined in the regulations at 43 CFR 3400.0-5 (gg) (1) and (2).

Only those federal coal lands that pass these screens are given further consideration for leasing. BLM has applied these coal screens to federal coal lands in Campbell County several times, starting in the early 1980s. Most recently, in 1993, BLM began the process of reapplying these screens to federal coal lands in Campbell, Converse, and Sheridan Counties. This analysis was adopted in the 2001 BLM Buffalo Field Office RMP update (BLM 2001a). The results of this analysis are included as Appendix D of the 2001 BLM Buffalo Field Office RMP update, which can be viewed in the 2001 NEPA documents section on the Wyoming BLM website at <http://www.wy.blm.gov>.

A coal tract that is acceptable for further consideration for leasing must be located within an area that has been determined to have coal development potential (43 CFR 3420.1-4(e)(1)). The Maysdorf coal lease application is within the area identified as having coal development potential by the BLM in the coal screening analyses published in 2001 BLM Buffalo Field Office planning document.

The coal mining unsuitability criteria listed in the federal coal management regulations (43 CFR 3461) have been applied to high to moderate coal development potential lands in the Wyoming PRB. Appendix B of this EIS summarizes the unsuitability criteria, describes the general findings for the 2001 BLM Buffalo Field Office RMP update, and presents a validation of these findings for the Maysdorf LBA Tract.

A multiple land use conflict analysis is completed as part of the coal screening process to identify and "eliminate additional coal deposits from further consideration for leasing to protect resource values of a locally important or unique nature not included in the unsuitability criteria", in accordance with 43 CFR 3420.1-4(e)(3). The 2001 Buffalo RMP update addresses two types of multiple land use conflicts: municipal/residential conflicts and multiple mineral development (coal versus oil and gas) conflicts. The Maysdorf LBA Tract does not lie within or in proximity to an identified buffer zone surrounding an existing community. Therefore, no federal coal lands within the Maysdorf LBA Tract have been eliminated from further consideration for leasing due to municipal/residential conflicts.

The 2001 Buffalo RMP includes two decisions related to multiple mineral development conflicts in Campbell, Converse and Sheridan Counties. With respect to oil and gas leasing in coal mining areas, the RMP update determines that oil and gas tracts that would interfere with coal mining operations would not be offered for lease but that, where possible, oil and gas leases will be issued with specific conditions to prevent a development conflict with coal mining operations. With respect to coal leasing in oil and gas fields, the 2001 Buffalo Update states that coal leasing in producing oil and gas fields would be deferred unless or until coal development would not interfere with the economic recovery of the oil and gas resources, as determined on a case by case basis.

Both conventional and CBNG wells presently exist inside and around the Maysdorf LBA Tract and BLM has evaluated the potential for conflict with the development of oil and gas resources within the Maysdorf LBA Tract (see the Mineral Resources discussion in Chapter 3, Section 3.3). BLM's policy on conflicts between coal and CBNG development is to optimize the recovery of both resources and ensure that the public receives a reasonable return, as explained in BLM Instruction Memorandum No. 2006-153 (BLM 2006a).

Surface owner consultation was completed during the preparation of coal screening analyses published in 2001 Buffalo RMP. Qualified private surface owners in the Gillette coal development potential area were provided the opportunity to express their preference for or against surface mining of federal coal under their private surface estate during both these screenings (see Chapter 7 for a definition of a "qualified surface owner"). No federal coal lands within the Maysdorf LBA Tract were eliminated from further consideration for leasing due to qualified surface owner conflicts at that time. The current surface ownership of the LBA tract is discussed in Section 1.1 of this chapter and in Section 3.11. Private surface owners who are determined to be qualified must consent to leasing before BLM can offer the underlying federal coal for lease. BLM has determined that one owner of surface lands included in the Maysdorf LBA Tract meets the requirements listed under 43 CFR 3400.0-5gg and is considered to be a qualified surface owner. In the event that surface owner does not consent to leasing, their land will be removed from the tract prior to holding a lease sale.

In summary, the lands in the CMC coal lease application are considered acceptable for further consideration for leasing, pending completion of the surface owner consultation.

1.6 Consultation and Coordination

Initial Involvement

BLM received the Maysdorf coal lease application on September 20, 2001. The application was initially reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands. The BLM ruled that the application and lands involved met the requirements of regulations governing coal leasing on application (43 CFR 3425).

The BLM Wyoming State Director notified the Governor of Wyoming on December 5, 2001, that CMC had filed a lease application with BLM for the Maysdorf LBA Tract. A notice announcing the receipt of the Maysdorf coal lease application published in the *Federal Register* on April 29, 2002 served as public notice that this coal lease application had been received. Copies of the notice were sent to voting and nonvoting members of the PRRCT, including the governors of Wyoming and Montana, the Northern Cheyenne Tribe, the Crow Tribal Council, OSM, USFWS, National Park Service, and U.S. Geological Survey. In the December 5, 2001 letter to the Governor of Wyoming and in the April 29, 2002 *Federal Register* notice, the tract is referred to as the Mt. Logan LBA Tract. By the time the PRRCT meeting was held on May 30, 2002, CMC had submitted its first modification to the application to the BLM (on May 21, 2002) and renamed the tract the Maysdorf LBA Tract.

The PRRCT reviewed this lease application at public meetings held on May 30, 2002, in Casper, Wyoming, and on April 27, 2005, in Gillette, Wyoming. CMC presented information about their existing mine and the pending lease application to the PRRCT at those meetings. The PRRCT recommended that the BLM continue to process this application. The major steps in processing an LBA are shown in Appendix C.

The BLM published a Notice of Intent to Prepare an Environmental Impact Statement and Notice of Scoping in the *Federal Register* on February 1, 2005 and in the Gillette News-Record on January 25, 2005 and February 1, 2005. The publications announced the time and location of a public scoping meeting and requested public comment on the application. Letters requesting public comment and announcing the time and location of the public scoping meeting were mailed to all parties on the distribution list in January 2005.

A public scoping meeting was held on February 15, 2005 in Gillette, Wyoming. At the public meeting, the applicant orally presented information about their mine and their need for the coal. The presentation was followed by a question and answer period, during which no oral comments were made. The scoping period extended from February 1 through April 8, 2005, during which time BLM received written comments from three entities.

Chapter 5 provides a list of other federal, state, and local governmental agencies that were consulted in preparation of this EIS and the distribution list for this EIS.

Issues and Concerns

Issues and concerns that have been expressed by the public and government agencies relating to the potential impacts of leasing the Maysdorf LBA Tract, specifically, and to previous coal lease applications in general include:

- potential conflicts with existing conventional oil and gas development and existing and proposed CBNG development;
- cumulative impacts of mineral development to all other resources;
- validity and currency of resource data;
- public access;
- potential impacts to threatened and endangered species and other species of concern;
- potential air quality impacts (including cumulative impacts to visibility);
- potential surface and groundwater quality and quantity impacts;
- potential impacts of and possible mitigation for nitrogen oxide emissions resulting from blasting of coal and overburden;
- the need to include reasonably foreseeable actions such as the construction and operation of the DM&E railroad and power plants in the cumulative analysis;
- the need to address increasing coal production in the PRB in the cumulative analysis;
- potential impacts on cultural and paleontological resources;
- potential impacts to wetland resources; and
- short- and long-term impacts on aquatic and terrestrial wildlife species and, specifically with respect to the Maysdorf LBA Tract, potential impacts to the aquatic resources of the Belle Fourche River.

Draft EIS

Parties on the distribution list were sent copies of the Draft EIS, and copies were made available for review at the BLM offices in Casper and Cheyenne, Wyoming.

A notice announcing the availability of the Draft EIS was published in the *Federal Register* by the EPA on May 26, 2006. A 60-day comment period on the Draft EIS commenced with publication of the EPA's notice of availability and ended on July 25, 2006. The BLM published a Notice of Availability/Notice of Public Hearing in the *Federal Register* on May 26, 2006. The BLM's *Federal Register* notice announced the date and time of a public hearing, which was held on June 13, 2006 in Gillette, Wyoming. The purpose of the public hearing was to solicit public comments on the Draft EIS and on the fair market value, the maximum economic recovery, and the proposed competitive sale of federal coal from the LBA tract. The BLM also published a notice of public hearing in the Gillette News-Record on May 26 and June 2, 2006.

Final EIS and Future Involvement

The BLM received written comments from five entities, which are included, with agency responses, in Appendix

H. Availability of the Final EIS will be published in the *Federal Register* by the BLM and the EPA. After a 30-day availability period, BLM will make a decision to hold or not to hold a competitive lease sale for the federal coal in the Maysdorf LBA Tract. A public Record of Decision for the tract will be mailed to parties on the mailing list and others who commented on this EIS during the NEPA process. The public and/or the applicant can appeal the BLM decision to hold or not to hold a competitive sale and issue a lease for the tract. The BLM decision must be appealed within 30 days from the date the Notice of Availability for the Record of Decision is published in the *Federal Register.* The decision can be implemented at that time if no appeal is received. If a competitive lease sale is held, the lease sale will follow the procedures set forth in 43 CFR 3422, 43 CFR 3425, and BLM Handbook H-3420-1 (Competitive Coal Leasing).

Department of Justice Consultation

After a competitive coal lease sale, but prior to issuance of a lease, the BLM must solicit the opinion of the Department of Justice on whether the planned lease issuance creates a situation inconsistent with federal antitrust laws. The Department of Justice is allowed 30 days to make this determination. If the Department of Justice has not responded in writing within the 30 days, the BLM can proceed with issuance of the lease.

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and alternatives to this action. The Proposed Action is to hold a competitive lease sale and issue a lease for the federal coal lands included in the Maysdorf LBA[1] Tract as applied for by CMC. This alternative assumes the tract would be developed as a maintenance tract for the existing Cordero Rojo Mine.

Under the Proposed Action, the tract would be offered for lease as applied for at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the PRB and that tract. The boundaries of the tract would be consistent with the tract configuration proposed by the applicant. The Proposed Action assumes that the applicant would be the successful bidder on the tract, and that the tract would be mined as a maintenance lease for an existing mine.

NEPA requires the consideration and evaluation of other reasonable ways to meet proposal objectives while minimizing or avoiding environmental impacts. Thus, NEPA requires the evaluation of a No Action Alternative and a practical range of other "reasonable" action alternatives that may avoid or minimize project impacts. Reasonable alternatives are defined by NEPA as those that are technically, economically, and environmentally practical and feasible. Reasonable alternatives are formulated to address issues and concerns raised by the public and agencies during scoping. These alternatives should represent another means of satisfying the stated purpose and need for the federal action.

The No Action Alternative (Alternative 1) is to reject the Maysdorf lease application. Under the No Action Alternative, the tract would not be offered for competitive sale, and the coal contained within the tract would not be mined as proposed. Rejection of the application would not affect currently permitted mining activities on existing leases at the existing applicant mine and selection of the No Action Alternative would not preclude an application to lease the rejected tract in the future. Portions of the surface of the LBA tract would probably be disturbed due to overstripping to allow coal to be removed from the adjacent existing leases.

BLM evaluates alternate tract configurations as alternatives to the Proposed Action. In evaluating this lease application, BLM has identified a study area for the tract which includes the tract as applied for and adjacent unleased federal coal. The Maysdorf LBA Tract as applied for (Proposed Action) and the adjacent coal included in the study area are shown in Figure 2-1a. Alternatives 2 and 3 evaluate the study area for the purpose of identifying feasible alternate tract configurations. Alternative 3, which is BLM's preferred alternative, evaluates splitting the application area into a

---

[1] Refer to page xv for a list of abbreviations and acronyms used in this document.

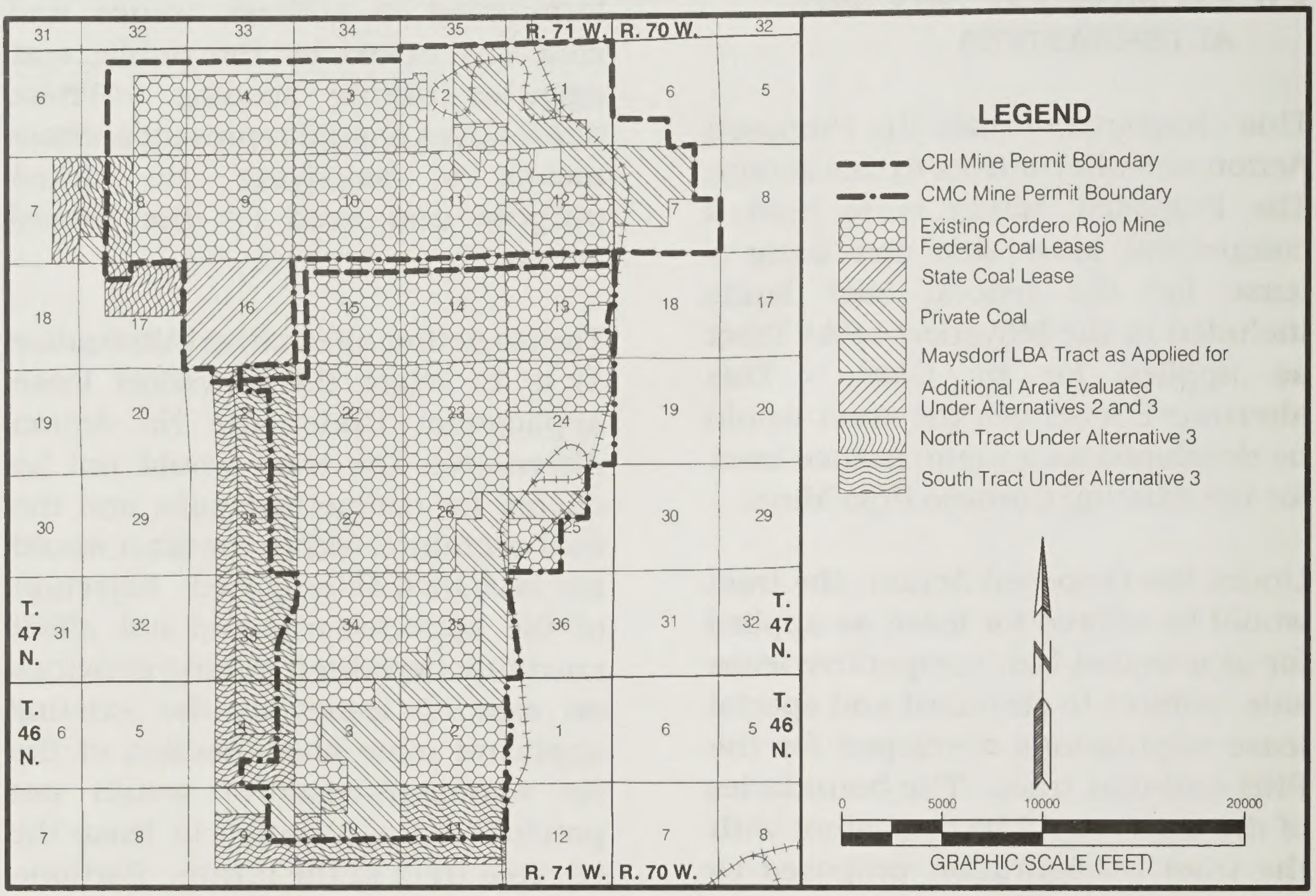

LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Existing Cordero Rojo Mine Federal Coal Leases
State Coal Lease
Private Coal
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3
South Tract Under Alternative 3
R. 71 W.
R. 70 W.
T. 47 N.
T. 46 N.
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure 2-1a. Maysdorf LBA Alternative Tract Configurations.

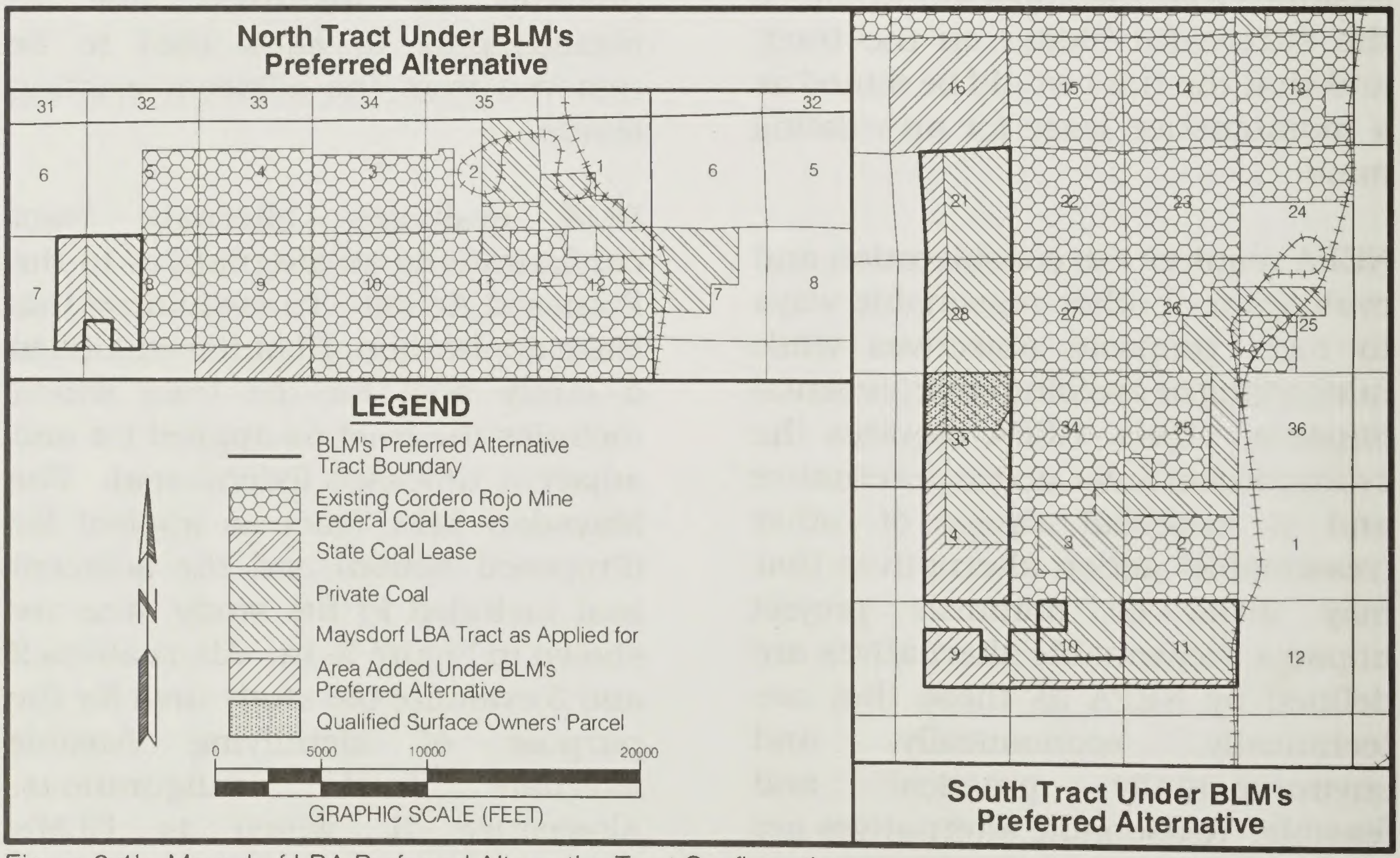

North Tract Under BLM's Preferred Alternative
South Tract Under BLM's Preferred Alternative
LEGEND
BLM's Preferred Alternative Tract Boundary
Existing Cordero Rojo Mine Federal Coal Leases
State Coal Lease
Private Coal
Maysdorf LBA Tract as Applied for
Area Added Under BLM's Preferred Alternative
Qualified Surface Owners' Parcel
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure 2-1b. Maysdorf LBA Preferred Alternative Tract Configuration.

north tract and a south tract (Figure 2-1b).

Under Alternatives 2 and 3, BLM could add some or all of the adjacent coal shown in Figure 2-1a to the tract as applied for. BLM could also reduce the size of the tract as applied for under these alternatives, based on economical, technical, or environmental considerations, or based on the BLM Competitive Coal Leasing Manual (BLM Manual 3420-1), which requires the BLM to evaluate modifying the configuration of the tract as applied for, based on providing for maximum economic recovery of the coal resource, maintaining or increasing the potential for competition, and avoiding future bypass or captive tract situations.

Other alternatives considered but not analyzed in detail include:

- holding a competitive lease sale and issuing a lease for federal coal lands included in the Maysdorf LBA Tract (as applied for or as modified by BLM), with the assumption that the tract would be developed as a new mine (Alternative 4); and
- delaying the sale of the Maysdorf LBA Tract as applied for in order to take advantage of higher coal prices and/or to allow recovery of the potential CBNG resources in the tract prior to mining (Alternative 5). Under this alternative, it is assumed that the tract could be developed later as a maintenance tract or a new mine start, depending on how long the sale was delayed.

LBA tracts are nominated for leasing by companies with an interest in acquiring them but, as discussed in Chapter 1, the LBA process is, by law and regulation, an open, public, competitive sealed-bid process. If a tract is offered for lease, the applicant for that tract may or may not be the high bidder when the lease sale is held. The Action Alternatives (the Proposed Action and Alternatives 2 and 3) considered in this EIS assume that CMC would be the successful bidder if the federal coal included in the tract is offered for lease, and that the Maysdorf LBA Tract would be mined as a maintenance tract for the permitted Cordero Rojo Mine.

If a decision is made to hold a competitive lease sale and there is a successful bidder, a detailed mining and reclamation plan must be developed by the successful bidder and approved before mining can begin on the tract. As discussed in Section 1.3, the mining and reclamation plan would undergo detailed review by state and federal agencies as part of the approval process. Those detailed plans could potentially differ from the more general plans used to analyze the impacts of the Proposed Action and Alternatives 2 and 3 in this EIS, but the differences would not be expected to substantially change the impacts described here. These differences would typically be related to the details of mining and reclaiming the tract but major factors, like the approximate number of tons of coal to be mined and yards of overburden to be removed, the acres disturbed, etcetera, would not be substantially different from the plans used in this analysis.

Under the Action Alternatives, it is assumed that an area larger than the tract would have to be disturbed in order to recover all of the coal in that tract. The disturbances outside the coal removal area would be due to activities like overstripping, matching undisturbed topography, and construction of flood control and sediment control structures.

2.1 Proposed Action

Under the Proposed Action, the Maysdorf LBA Tract, as applied for by CMC, would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the PRB (Appendix D). The boundaries of the tract would be consistent with the tract configuration proposed in the Maysdorf LBA Tract lease application (Figure 2-1a). The Proposed Action assumes that CMC would be the successful bidder on the Maysdorf LBA Tract if it is offered for sale.

The legal description of the proposed Maysdorf LBA Tract coal lease lands as applied for by CMC under the Proposed Action is as follows:

T.46N., R.71W., 6th P.M., Campbell County, Wyoming

Section 4: Lots 5, 6, 7(E½E½), 10(E½E½), 11, and 12;
185.05 acres

Section 10: Lots 1, 2, 3(N½, N½S½), 4(N½, N½S½), 5(N½, N½S½), and 6(N½, N½S½);
203.32 acres

Section 11: Lots 1 through 8, 9(N½, N½S½), 10(N½, N½S½), 11(N½, N½S½), and 12(N½, N½S½);
446.80 acres

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 8: Lots 3 through 6 and 11 through 13;
278.36 acres

Section 21: Lots 1, 2, 3(E½E½), 6(E½E½), 7 through 10, 11(E½E½), 14(E½E½), 15, and 16;
364.77 acres

Section 28: Lots 1, 2, 3(E½E½), 6(E½E½), 7 through 10, 11(E½E½), 14(E½E½), 15, and 16;
369.71 acres

Section 33: Lots 1, 2, 3(E½E½), 6(E½E½), 7 through 10, 11(E½E½), 14(E½E½), 15, and 16;
371.38 acres

Total: 2,219.39 acres

Land descriptions and acreage are based on the BLM Status of Public Domain Land and Mineral Titles approved Coal Plats as of April 15, 2004 and December 6, 2004. The ownership of the coal estate in the area applied for is federal, but there is private coal and state coal in this area (Figure 2-1a and 2-1b). The ownership of the surface and oil and gas estates is discussed in Section 3.11.

The BLM has determined that Leslie E. and Sandra K. Haight, who own surface lands included in the

Maysdorf LBA Tract, meet the requirements listed under 43 CFR 3400.0-5gg and are therefore considered to be qualified surface owners. They own a ⅛ interest in the following lands:

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 33: Lots 1 through 3, 6, 7, and 8 (that part lying west of the east ROW line of the Hilight Road).

In the event that these qualified surface owners do not consent to leasing, the lands described above and shown in Figure 2-1b will be removed from the tract prior to holding a lease sale.

As indicated in Chapter 1, some of the coal in the above-described lands in the Maysdorf LBA Tract is not currently considered to be recoverable due to the presence of the BNSF & UP railroad tracks and associated ROW and the tract includes an area where no coal is present due to erosion or non-deposition (a "no-coal" zone). Although these lands would not be mined, they are included in the tract to:

- allow maximum recovery of all the mineable coal that is adjacent to but outside of the railroad ROW and its associated buffer zone;
- allow maximum recovery of all of the mineable coal that surrounds the "no-coal" zone; and
- comply with the coal leasing regulations that do not allow leasing of less than 10-acre aliquot parts.

Two Native American tribes have indicated they have concerns with disturbance of the cultural sites in this area, but no specific sites have been identified as traditional cultural properties by either tribe at this time. If one or both of these tribes identify specific sites that have special historical, cultural, religious or sacred significance to their tribes, appropriate action must be taken to address concerns related to those sites.

The Maysdorf tract as applied for includes approximately 2,219.39 acres. CMC estimates that it includes approximately 234.8 million tons of in-place coal, that approximately 230.3 million tons of those in-place coal reserves are mineable, and that about 216.5 million tons of coal would be recoverable from the Maysdorf LBA Tract as applied for. CMC's estimate that approximately 92 percent of the estimated in-place reserves would be recoverable from the tract is based on assumptions about the currently unrecoverable reserves that lie within the railroad ROW and how extensive the "no-coal" zone is.

BLM has independently evaluated the volume and average quality of the coal resources included in the Maysdorf LBA Tract as part of the fair market value determination process. The fact that the coal within the railroad ROW and associated buffer zone would not be recovered and the presence of the "no-coal" zone was considered by BLM in evaluating the coal reserve included in the LBA tract. BLM's estimate of the mineable federal coal reserves and average quality of the coal included in the tract may not be in agreement with the mineable coal reserve and coal quality estimates provided by the applicant. BLM's estimate of the mineable reserves and average quality of the coal included in the tract under BLM's preferred alternative (Alternative 3) are discussed below and will be published in the sale notice if the tract is offered for sale.

As discussed in Chapter 1 and shown in Figure 2-1a, the Cordero Rojo Mine is comprised of the former Cordero Mining Company (CMC) Mine and the contiguous former Caballo Rojo, Inc. (CRI) Mine. Currently, the mine has two approved permits to mine:

- Cordero Mining Company Mine Permit 237 Term T7 (CMC 2004), and
- Caballo Rojo, Inc. Mine Permit 511 Term T6 (CRI 2002).

CMC is working with the WDEQ/LQD to consolidate the Cordero and Caballo Rojo mining permits into a single mining permit for the Cordero Rojo Mine. CMC anticipates approval of the permit consolidation by WDEQ/LQD in 2007.

The Maysdorf LBA Tract would be mined as an integral part of the Cordero Rojo Mine under the Proposed Action. Since the Maysdorf LBA Tract would be an extension of the existing Cordero Rojo Mine, the facilities and infrastructure would be the same as those identified in the WDEQ/LQD Mine Permit 237 Term T7 and the WDEQ/LQD Mine Permit 511 Term T6, approved September 21, 2004 and May 15, 2002, respectively, and the BLM R2P2s, which were approved April 24, 2003 for both the Cordero Mine and the Caballo Rojo Mine.

CMC's currently approved air quality permit from the WDEQ/AQD for the Cordero Rojo Mine allows up to 65 million tons of coal per year to be mined. The Cordero Rojo Mine produced:

- 38.6 million tons of coal in 2000,
- 43.5 million tons of coal in 2001,
- 38.2 million tons of coal in 2002,
- 36.1 million tons of coal in 2003,
- 38.8 million tons of coal in 2004, and
- 37.5 million tons of coal in 2005

(Wyoming Department of Employment 2000, 2001, 2002, 2003, 2004, and 2005a).

Under the currently approved mining plan (the No Action Alternative), the Cordero Rojo Mine would mine its remaining 388.1 million tons of in-place coal reserves in approximately nine years at an average production rate of approximately 40 mmtpy (the projected production rate ranges between 19.1 mmtpy to 46 mmtpy). Under the Proposed Action, CMC estimates that average annual coal production would continue to be approximately 40 million tons (the projected production rate ranges between 8.3 mmtpy to 46 mmtpy), and the life of the mine would be extended by approximately six years.

If CMC acquires the Maysdorf LBA Tract as applied for, they estimate that a total of 581.3 million tons of coal would be mined from the existing leases and the Maysdorf LBA Tract after January 1, 2006, with an estimated 216.5 million tons coming from the LBA tract, as discussed above. This estimate of recoverable reserves assumes that about six percent of the mineable coal included within the Cordero Rojo Mine's current permit area would be lost under normal mining practices, based on historical recovery factors. About eight percent of the in-place coal in the LBA tract would be lost under normal mining practices or would not be recovered due to the presence of the BNSF & UP railroad ROW and the "no-coal" zone. As of December 31, 2005, approximately 650.3 million tons of coal had been mined from within the current permitted area of the mine.

Prior to disturbance and in advance of mining, mine support structures such as roads, power lines, substations, and flood and sediment control measures would be built as needed. The Belle Fourche River runs through the existing mine and the southern end of the LBA tract. Approximately six miles of the natural channel has been diverted to date within the Cordero Rojo Mine's current permit area. CMC would propose another diversion of the Belle Fourche River if they acquire a lease for the Maysdorf LBA Tract.

Topsoil removal with suitable heavy equipment, such as rubber-tired scrapers, would proceed ahead of overburden removal. Whenever possible, direct haulage to a reclamation area would be done but, due to scheduling, some topsoil would be temporarily stockpiled. As required by the reclamation plan, heavy equipment again would be used to haul and distribute the stockpiled topsoil.

The Cordero Rojo Mine is one of several mines currently operating in the PRB where the coal seams are notably thick and the overburden is relatively thin. Mining would be conducted in five separate, semi-independent pits identified as the Thumb Pit, Rojo (or North) Pit, Dogleg Pit, Middle Pit, and South Pit. The multi-pit concept has been and would be utilized to reduce operating costs by blending production from areas having different stripping ratios and coal quality, and also to help stabilize manpower requirements. Overburden removal has been and would continue to be conducted using trucks and shovels, draglines, and/or direct cast blasting. Other equipment used during overburden removal and backfilling would include dozers, scrapers, excavators, front-end loaders, graders, and water trucks. Most overburden and all coal have been and would continue to be drilled and blasted to facilitate efficient excavation. The design of the Cordero Rojo Mine seeks to confine disturbance to the active mine blocks. As overburden is removed, most would be directly placed into areas where coal has already been removed.

Once the overburden has been replaced it is sampled and verified to be suitable for reclamation, then graded to approximate final contour, ripped and finally topsoiled. Material that is found to be unsuitable for reclamation (i.e., material that is not suitable for use in reestablishing vegetation or that may affect groundwater quality due to high concentrations of certain constituents, such as selenium, or adverse pH levels) would either be removed and treated, or adequately covered with suitable overburden material prior to grading and topsoiling. Elevations consistent with an approved PMT plan would be established as quickly as possible. Under certain conditions, the PMT may not be immediately achievable. This occurs when there is an excess of material that may require temporary stockpiling, when there is insufficient material available from current overburden removal operations, or when future mining could redisturb an area already mined. Once a seedbed has been formed, vegetation would be reestablished that is consistent with the postmining land use.

Coal would be produced from one coal seam, that CMC refers to as the Wyodak inside the CMC mine permit area (average thickness = 57 ft) and the Wyodak-Anderson inside the CRI mine permit area (average thickness = 64 ft). Coal would be mined at several working faces to enable blending of the coal to meet customer quality requirements, to comply with BLM lease requirements for maximum economic recovery of the coal resource, and to optimize coal removal efficiency with available equipment. Coal would be loaded with electric-powered shovels into off-highway haul trucks for transport to crushing facilities. Coal haul roads would be temporary structures built within the mine areas. The Cordero Rojo Mine utilizes two separate, existing coal crushing facilities; the north pit facilities located within the CRI Mine permit area and the south plant facilities located within the CMC Mine permit area (Figure 1-2), which provide the capacity to produce at the permitted level. A haulroad was permitted and constructed in 1997 to provide a direct route between the two coal processing plant facilities. All coal crushing operations and conveying, transferring, and storage facilities are equipped with atomizer/fogger systems for dust control. There are four existing coal storage silos and a covered storage slot at the south plant facilities and two existing coal storage silos at the north plant facilities. While sufficient storage capacity exists, future changes in facilities may be constructed to improve operating efficiency and air quality protection. For example, a covered slot storage barn, covered dome, or other appropriate storage structure may be built at the north plant. In addition, a covered overland conveyor and near-pit crusher system may be constructed and moved as the mining operation progresses.

Full-time employment at the Cordero Rojo Mine is currently 470, but the average full-time employment level under the No Action Alternative is expected to be 443 persons at the expected average annual post-2005 coal production of 40 million tons. Under the Proposed Action, the average annual coal production rate would not increase; however, the average employment is expected to be approximately 463 persons for an additional six years.

The Maysdorf LBA Tract was applied for by CMC, but the North Maysdorf LBA Tract described under Alternative 3 is also adjacent to the Belle Ayr Mine, operated by Foundation Coal West, Inc. (see Figure 1-1). As a result, Foundation Coal West, Inc. is potentially in a position to mine the North Maysdorf LBA Tract. The South Maysdorf LBA Tract described under Alternative 3 is adjacent to existing leases at the Cordero Rojo Mine only. If a company other than CMC was to acquire one or both tracts, the rate of coal production, mining sequence, equipment, and facilities would be different than if CMC acquired one or both tracts as maintenance leases, as described above. However, the area of disturbance and the impacts of removing the coal would not be substantially different from the area of disturbance and the impacts of CMC mining the tract.

2.1.1 Regulatory Compliance, Mitigation and Monitoring

SMCRA and Wyoming State Law require the collection of extensive baseline information and extensive monitoring and mitigation measures. The currently approved mining permits and the proposed consolidated mining permit for the Cordero Rojo Mine include these requirements. Monitoring and mitigation measures that are required by regulation are considered to be part of the Proposed Action and Alternatives 2 and 3 considered in this EIS for the Maysdorf LBA Tract. These requirements, mitigation plans, and monitoring plans are in place for the No Action Alternative, as part of the current approved mining and reclamation plan for the existing Cordero Rojo Mine. These requirements, mitigation plans, and monitoring plans would be included in the mining and reclamation plan amendment that would be required for the Maysdorf LBA Tract if it is leased and permitted for mining. This mining and reclamation plan amendment would have to be approved before mining could occur on the tract, regardless of who acquires the tract. The major mitigation and monitoring measures that are required by state or federal regulation are summarized in Table 2-1. More specific information about some of these mitigation and monitoring measures and their results at the Cordero Rojo Mine are described in Chapter 3.

If impacts are identified during the leasing process that are not addressed by existing required mitigation measures, BLM can include additional mitigation measures, in the form of stipulations on the new lease, within the limits of its regulatory authority. In general, the levels of mitigation and monitoring required for surface coal mining by SMCRA and Wyoming State law are more extensive than those required for other surface disturbing activities; however, concerns may periodically be

Table 2-1. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law for all Alternatives.

Resource	Regulatory Compliance or Mitigation Required by Stipulations, State or Federal Law[1]	Monitoring[1]
Topography & Physiography	Restoring to approximate original contour or other approved topographic configuration.	LQD checks as-built vs. approved topography with each annual report.
Geology & Minerals	Identifying & selectively placing or mixing chemically or physically unsuitable overburden materials to minimize adverse effects to vegetation or groundwater.	LQD requires monitoring in advance of mining to detect unsuitable overburden.
Soils	Salvaging soil suitable to support plant growth for use in reclamation; Protecting soil stockpiles from disturbance and erosional influences; Selectively placing at least four ft of suitable overburden on the graded backfill surface below replaced topsoil to meet guidelines for vegetation root zones.	Monitoring vegetation growth on reclaimed areas to determine need for soil amendments; Sampling regraded overburden for compliance with root zone criteria.
Air Quality	Dispersion modeling of mining plans for annual average particulate pollution impacts on ambient air; Using particulate pollution control technologies; Using work practices designed to minimize fugitive particulate emissions; Using EPA- or state-mandated BACT, including: Fabric filtration or wet scrubbing of coal storage silo and conveyor vents, Watering or using chemical dust suppression on haul roads and exposed soils, Containment of truck dumps and primary crushers, Covering of conveyors, Prompt revegetation of exposed soils, High efficiency baghouse dust collection systems or PECs, or atomizers/foggers on the crusher, conveyor transfer, storage bin and train loadout, meeting a standard of 0.01 grains per dry standard cubic foot (dscf) of exit volume, Watering of active work areas, Reclamation plan to minimize surface disturbances subject to wind erosion, Paving of access roads, Haul truck speed limits, Limited material drop heights for shovels and draglines.	On-site air quality monitoring for PM_{10} or TSP; Off-site ambient monitoring for PM_{10} or TSP; On-site compliance inspections.

---

[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Cordero Rojo Mine in its current approved mining and reclamation plan (the No Action Alternative). If the Maysdorf LBA Tract were leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the Maysdorf LBA Tract that must be approved before mining can occur on the tract under the Action Alternatives.

Table 2-1. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law for all Alternatives (Continued).

Resource	Regulatory Compliance or Mitigation Required by Stipulations, State or Federal Law[1]	Monitoring[1]
Air Quality (continued)	Following voluntary and required measures to avoid exposing the public to NO_2 from blasting clouds, including: Phone notification of neighbors and workers prior to blasting, Monitoring weather and atmospheric conditions prior to decisions to blast, Timing blasts to avoid temperature inversions and to minimize inconvenience to neighbors, Closing public roads when appropriate to protect the public, Minimizing blast sizes, Posting signs on major public roads.	
Surface Water	Building and maintaining sediment control ponds or other devices during mining; Restoring approximate original drainage patterns during reclamation; Restoring stock ponds and playas during reclamation.	Monitoring storage capacity in sediment ponds; Monitoring quality of discharges; Monitoring streamflow and water quality.
Groundwater Quantity	Evaluating cumulative impacts to water quantity associated with proposed mining; Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quantity.	Monitoring wells track water levels in overburden, coal, interburden, underburden, and backfill.
Groundwater Quality	Evaluating cumulative impacts to water quality associated with proposed mining; Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quality.	Monitoring wells track water quality in overburden, coal, interburden, underburden, and backfill.
Alluvial Valley Floors	Identifying all AVFs that would be affected by mining; Determining significance to agriculture of all identified AVFs affected by mining (WDEQ); Protecting downstream AVFs during mining; Restoring essential hydrologic function of all AVFs affected by mining.	Monitoring to determine restoration of essential hydrologic functions of any declared AVF.
Wetlands	Identifying all wetlands that would be affected by mining; Identifying jurisdictional wetlands (COE); Replacing all jurisdictional wetlands that would be disturbed by mining; Replacing functional wetlands as required by surface managing agency, surface landowner, or WDEQ/LQD.	Monitoring of reclaimed wetlands using same procedures used to identify pre-mining jurisdictional wetlands.

---

[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Cordero Rojo Mine in its current approved mining and reclamation plan (the No Action Alternative). If the Maysdorf LBA Tract were leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the Maysdorf LBA Tract that must be approved before mining can occur on the tract under the Action Alternatives.

Table 2-1. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law for all Alternatives (Continued).

Resource	Regulatory Compliance or Mitigation Required by Stipulations, State or Federal Law[1]	Monitoring[1]
Vegetation	Permanently revegetating reclaimed areas according to a comprehensive revegetation plan using approved permanent reclamation seed mixtures consisting predominantly of species native to the area; Reclaiming 20 percent of reclaimed area with native shrubs at a density of one per square meter; Controlling erosion on reclaimed lands prior to seeding with final seed mixture using mulching, cover crops, or other approved measures; Chemically and mechanically controlling weed infestation; Direct hauling of topsoil; Selectively planting shrubs in riparian areas; Planting sagebrush; Creating depressions and rock piles; Using special planting procedures around rock piles; Posting reclamation bond covering the cost of reclamation.	Monitoring of revegetation growth & diversity until release of final reclamation bond (minimum 10 years); Monitoring of erosion to determine need for corrective action during establishment of vegetation; Use of controlled grazing during revegetation evaluation to determine suitability for post-mining land uses.
Wildlife	Restoring pre-mining topography to the maximum extent possible; Planting a diverse mixture of grasses, forbs, and shrubs in configurations beneficial to wildlife; Designing fences to permit wildlife passage; Raptor-proofing power transmission poles; Creating artificial raptor nest sites; Increasing habitat diversity by creating rock clusters and shallow depressions on reclaimed land; Cottonwood plantings along reclaimed drainages; Replacing drainages, wetlands, and AVFs disturbed by mining; Reducing vehicle speed limits to minimize mortality; Instructing employees not to harass or disturb wildlife; Following approved raptor mitigation plans.	Baseline and annual wildlife monitoring surveys; Monitoring for Migratory Bird Species of Management Concern in Wyoming.
Threatened, Endangered, Proposed, and Candidate Species	Avoiding bald eagle disturbance; Restoring bald eagle foraging areas disturbed by mining; Restoring mountain plover habitat disturbed by mining; Using raptor safe power lines; Surveying for Ute ladies'-tresses;	Baseline and annual wildlife monitoring surveys.

---

[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Cordero Rojo Mine in its current approved mining and reclamation plan (the No Action Alternative). If the Maysdorf LBA Tract were leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the Maysdorf LBA Tract that must be approved before mining can occur on the tract under the Action Alternatives.

Table 2-1. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law for all Alternatives (Continued).

Resource	**Regulatory Compliance or Mitigation Required by Stipulations, State or Federal Law**[1]	**Monitoring**[1]
Threatened, Endangered, Proposed, and Candidate Species (continued)	Surveying for mountain plover; Searching for black-footed ferrets if prairie dog colonies are on or move onto tract; Surveying for black-tailed prairie dog; Same as Wildlife Resource above.	Baseline and annual wildlife monitoring surveys.
Land Use	Suitably restoring reclaimed area for historic uses (grazing and wildlife);	Monitoring of controlled grazing prior to bond release evaluation.
Cultural Resources	Conducting Class I & III surveys to identify cultural properties on all state and federal lands and on private lands affected by federal undertakings; Consulting with SHPO to evaluate eligibility of cultural properties for the NRHP; Avoiding or recovering data from significant cultural properties identified by surveys, according to an approved plan; Notifying appropriate federal personnel if historic or prehistoric materials are uncovered during mining operations; Instructing employees of the importance of and regulatory obligations to protect cultural resources.	Monitoring of mining activities during topsoil stripping; cessation of activities and notification of authorities if unidentified sites are encountered during topsoil removal.
Native American Concerns	Notifying Native American tribes with known interest in this area of leasing action and requesting help in identifying potentially significant religious or cultural sites.	No specific monitoring program.
Paleontological Resources	Notifying appropriate federal personnel if potentially significant paleontological sites are discovered during mining.	No specific monitoring program.
Visual Resources	Restoring landscape character during reclamation through return to approximate original contour and revegetation with native species.	No specific monitoring program.
Noise	Protecting employees from hearing loss.	MSHA inspections.
Transportation Facilities	Relocating existing pipelines, if necessary, in accordance with specific agreement between pipeline owner and coal lessee.	No specific monitoring program.
Socioeconomics	Paying royalty and taxes as required by federal, state, and local regulations. No mitigation measures are proposed.	Surveying and reporting to document volume of coal removed.

---

[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Cordero Rojo Mine in its current approved mining and reclamation plan (the No Action Alternative). If the Maysdorf LBA Tract were leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the Maysdorf LBA Tract that must be approved before mining can occur on the tract under the Action Alternatives.

Table 2-1. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law for all Alternatives (Continued).

Resource	Regulatory Compliance or Mitigation Required by Stipulations, State or Federal Law[1]	Monitoring[1]
Hazardous & Solid Waste	Disposing of solid waste and sewage within permit boundaries according to approved plans; Storing and recycling waste oil; Maintaining of files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances used during course of mining; Ensuring that all production, use, storage, transport, and disposal of hazardous materials is in accordance with applicable existing or hereafter promulgated federal, state, and government requirements; Complying with emergency reporting requirements for releases of hazardous materials as established in CERCLA, as amended; Preparing and implementing spill prevention control and countermeasure plans, spill response plans, inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended; Preparing emergency response plans.	No specific monitoring other than required by these other regulations and response plans.

---

[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Cordero Rojo Mine in its current approved mining and reclamation plan (the No Action Alternative). If the Maysdorf LBA Tract were leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the Maysdorf LBA Tract that must be approved before mining can occur on the tract under the Action Alternatives.

identified that are not monitored or mitigated under existing procedures.

2.1.2 Hazardous and Solid Waste

Under the Proposed Action and Alternatives 2 and 3, the procedures and requirements for handling of hazardous and solid wastes would be the same as the procedures and requirements for the existing mining operation. Solid waste that is produced at the existing Cordero Rojo Mine consists of floor sweepings, shop rags, lubricant containers, welding rod ends, metal shavings, worn tires, packing material, used filters, and office and food wastes. A portion of the solid wastes produced at the Cordero Rojo Mine is disposed of within the mine's permit boundary in accordance with WDEQ-approved solid waste disposal plans. Solid waste is also disposed of at the Campbell County landfill. Sewage is handled by WDEQ-permitted sewage systems present on the existing mine facilities. Maintenance and lubrication of most of the equipment takes place at existing shop facilities at the Cordero Rojo Mine.

Major lubrication, oil changes, etcetera, of most equipment are performed inside the service building lubrication bays at the Cordero Rojo Mine, where used oil and grease are currently contained and deposited in storage tanks. All of the collected used oils and grease are then beneficially recycled off site or used for energy recovery, including blending with diesel fuel oil for use as equipment fuel. These practices would not change if the applicant acquires the LBA tract.

CMC has reviewed the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act* (SARA) *of 1986* (as amended) and EPA's *List of Extremely Hazardous Substances* as defined in 40 CFR 355 (as amended) for hazardous substances used at the Cordero Rojo Mine. CMC maintains files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances that are or would be used during the course of mining.

CMC is responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials as a result of mining are in accordance with all applicable existing or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. All mining activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials are and would continue to be conducted so as to minimize potential environmental impacts.

CMC must comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, is reported as required by CERCLA, as amended. The materials for which such notification must be given are the extremely hazardous substances listed in Section 302 of the *Emergency Planning and Community Right to Know Act* and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, immediate notice must be given to the WDEQ Solid and Hazardous Waste Division, WDEQ Water Quality Division, and all other appropriate federal and state agencies.

Each mining company is expected to prepare and implement several plans and/or policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans/policies include:

- Spill Prevention Control and Countermeasure Plans;
- Spill Response Plans;
- Stormwater Pollution Prevention Plans;
- Inventories of Hazardous Chemical Categories Pursuant to Section 313 of SARA, as Amended; and
- Emergency Response Plans.

All mining operations are also required to be in compliance with regulations promulgated under the Resource Conservation and Recovery Act, Federal Water Pollution Control Act (Clean Water Act), Safe Drinking Water Act, Toxic Substances Control Act, Mine Safety and Health Act, Department of Transportation, and the Federal Clean Air Act. In addition, mining operations must comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

Compliance with these rules is the current practice at the Cordero Rojo Mine. Acquisition of the Maysdorf LBA Tract by CMC would not change these current practices nor the type and quantity of any wastes generated and disposed of by the mine.

2.2 Alternative 1

Under the Maysdorf LBA Tract Alternative 1, the No Action Alternative, CMC's application to lease the coal included in the Maysdorf LBA Tract would be rejected, the tract would not be offered for competitive sale at this time, and the coal included in the tract would not be mined.

Rejection of the application would not affect permitted mining activities and employment on the existing leases at the Cordero Rojo Mine. The Cordero Rojo Mine currently leases approximately 10,629 acres of federal coal, 2,000 acres of private coal, and 640 acres of state coal; all of which are within the existing CRI and CMC Mine permit boundaries. A total of approximately 14,694 acres will eventually be affected in mining the current leases. If the Maysdorf LBA Tract is not leased, CMC estimates that the average annual production at the Cordero Rojo Mine after January 1, 2006 will continue to be 40 million tons, and the average full-time employment level is expected to be 443 persons.

Under the No Action Alternative, approved mining activities and employment will continue at both adjacent mines (Cordero Rojo and Belle Ayr). Portions of the surface of the LBA tract would probably be disturbed due to overstripping to allow coal to be removed from existing contiguous leases at both the Belle Ayr and Cordero Rojo Mines.

In order to compare the economic and environmental consequences of mining these lands versus not mining them, this EIS was prepared under the assumption that the Maysdorf LBA Tract would not be mined in the foreseeable future if the No Action Alternative is selected. However, selection of the No Action Alternative would not preclude leasing and mining of this tract in the future. If the decision is made to reject the Maysdorf lease application at this time, the tract could be leased as a maintenance lease in the future while the adjacent mine is in operation. If it is not leased while the existing adjacent mine is in operation, it may or may not be leased in the future. The tract being evaluated in this EIS does not include enough coal reserves to economically justify mining by a new operation; however, the coal reserves included in the tract could potentially be combined with unleased federal coal to the west and south to create a larger tract, which could be mined by a new operation in the future.

2.3 Alternative 2

Under Alternative 2 for the Maysdorf LBA Tract, BLM would reconfigure the tract, hold one competitive coal sale for the lands included in the reconfigured tract, and issue a lease to the successful bidder. The modified tract would be subject to standard and special lease stipulations developed for the PRB and this tract if it is offered for sale (Appendix D). Alternative 2 for the Maysdorf LBA Tract assumes that CMC would be the successful bidder on the tract if a lease sale is held and that the tract would be mined as a maintenance lease for the Cordero Rojo Mine. Other assumptions are the same as for the Proposed Action.

As applied for, the Maysdorf LBA Tract consists of three non-contiguous blocks of federal coal (Figure 1-2). In order to evaluate the potential that an alternate configuration of the tract would provide for more efficient recovery of the federal coal, increase competitive interest in the Maysdorf LBA Tract, and/or reduce the potential that some of the remaining unleased federal coal in this area would be bypassed in the future, BLM identified a study area, shown in Figure 2-1a. The BLM study area includes the tract as applied for and unleased federal coal adjacent to the western and southern edges of the tract as applied for. BLM could add some or all of the adjacent lands to the tract. Under this alternative, BLM could also reduce the size of the tract, as discussed in Section 2.0.

The area BLM is evaluating in addition to the tract as applied for includes the following lands:

T.46N., R.71W., 6th P.M., Campbell County, Wyoming

Section 4: Lots 7(W½, W½E½), 10(W½, W½E½), 13 through 15, and 18 through 20;
305.99 acres
Section 9: Lots 1 through 5;
204.50 acres

Section 10: Lots 3(S½S½), 4(S½S½), 5(S½S½), and 6(S½S½);
40.66 acres
Section 11: Lots 9(S½S½), 10(S½S½), 11(S½S½), and 12(S½S½);
40.48 acres

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 7: Lots 5, 12, 13, and 20;
167.53 acres
Section 17: Lots 1 through 3, and 5 through 7;
241.27 acres
Section 21: Lots 3(W½, W½E½), 6(W½, W½E½), 11(W½, W½E½), and 14(W½, W½E½);
119.62 acres
Section 28: Lots 3(W½, W½E½), 6(W½, W½E½), 11(W½, W½E½), and 14(W½, W½E½);
124.16 acres
Section 33: Lots 3(W½, W½E½), 6(W½, W½E½), 11(W½, W½E½), and 14(W½, W½E½);
123.80 acres

Total: 1,368.01 acres

Land descriptions and acreage are based on the BLM Status of Public Domain Land and Mineral Titles approved Coal Plats as of April 15, 2004 and December 6, 2004.

In evaluating the study area, BLM has made a decision to include all of the study area outside of the tract as applied for except for Section 17, T.47N., R.71W. in the Maysdorf LBA Tract, if a decision is made to offer the tract for lease under Alternative 2. The legal description of BLM's reconfiguration of the Maysdorf LBA Tract under Alternative 2 is as follows:

T.46N., R.71W., 6th P.M., Campbell County, Wyoming

Section 4: Lots 5 through 7, 10 through 15, and 18 through 20;
491.04 acres
Section 9: Lots 1 through 5;
204.50 acres
Section 10: Lots 1 through 6;
243.98 acres
Section 11: Lots 1 through 12;
487.28 acres

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 7: Lots 5, 12, 13 and 20;
167.53 acres
Section 8: Lots 3 through 6, and 11 through 13;
278.36 acres
Section 21: Lots 1 through 3, 6 through 11, and 14 through 16;
484.39 acres
Section 28: Lots 1 through 3, 6 through 11, and 14 through 16;
493.87 acres
Section 33: Lots 1 through 3, 6 through 11, and 14 through 16;
495.18 acres

Total: 3,346.13 acres

The BLM has determined that Leslie E. and Sandra K. Haight, who own surface lands included in the Maysdorf LBA Tract, meet the requirements listed under 43 CFR 3400.0-5gg and are therefore considered to be qualified surface owners. They own a ⅛ interest in the following lands:

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 33: Lots 1 through 3, 6, 7, and 8 (that part lying west of the east ROW line of the Hilight Road).

In the event that these qualified surface owners do not consent to leasing, the lands described above and shown in Figure 2-1b will be removed from the tract prior to holding a lease sale.

CMC estimates that the reconfigured tract includes approximately 342.3 million tons of in-place coal. As discussed under the Proposed Action, some of the coal included in the alternative tract configuration is currently considered to be unrecoverable due to the presence of the BNSF & UP railroad tracks and associated ROW. In addition, a portion of the reconfigured tract lies within a "no-coal" zone, as discussed under the Proposed Action. Although these lands would not be mined, they are included in this alternative tract configuration to:

- allow maximum recovery of all the mineable coal that is adjacent to but outside of the ROW and its associated buffer zone;
- allow maximum recovery of all of the mineable coal that surrounds the "no-coal" zone; and
- comply with the coal leasing regulations, which do not allow leasing of less than 10-acre aliquot parts.

Two Native American tribes have indicated they have concerns with disturbance of the cultural sites in this area, but no specific sites have been identified as traditional cultural properties by either tribe at this time. If one or both of these tribes identify specific sites that have special historical, cultural, religious or sacred significance to their tribes, appropriate action must be taken to address concerns related to those sites.

CMC estimates that about 337.9 million tons of the in-place reserves are mineable because portions of the 1,126.74 acres that would be added in this alternative under BLM's tract reconfiguration lie within the BNSF & UP railroad ROW and the "no-coal" zone. Using CMC's projected recovery factor of 94 percent of the mineable coal reserves included in BLM's tract reconfiguration, the tract would contain about 317.6 million tons of recoverable coal.

Under Alternative 2, CMC estimates that average annual coal production would continue to be approximately 40 million tons, the life of the mine would be extended by approximately nine years, and the average number of full-time employees would increase to approximately 495.

BLM has independently evaluated the volume and average quality of the coal resources included in the tract offered for sale as part of the fair market value determination process. The fact that the coal within the railroad ROW and its associated buffer zone would not be recovered and the presence of the "no-coal" zone was considered by BLM in evaluating the coal reserves included in the LBA tract. BLM's estimate of the mineable federal coal reserves and average quality of the coal included in the tract may not be in agreement with the mineable coal reserve and coal quality estimates provided by the applicant. BLM's estimate of the mineable federal coal reserves and average quality of the coal included in the tract under BLM's preferred alternative (Alternative 3) are discussed below and will be published in the sale notice for the tract, if it is offered for sale.

2.4 Alternative 3

Under Alternative 3 for the Maysdorf LBA Tract, BLM is considering dividing the tract as applied for into two tracts and offering one or both of those tracts for sale. A separate, competitive sealed bid sale would be held for each tract that is offered for sale, and each tract would be subject to standard and special lease stipulations developed for the PRB and for that tract (Appendix D). Alternative 3, offering two tracts for sale, is the BLM's preferred alternative.

If one or both of the tracts are offered for lease, Alternative 3 for the Maysdorf LBA Tract assumes that CMC would be the successful bidder and that the federal coal would be mined to extend the life of the existing Cordero Rojo Mine. Other assumptions would be the same as for the Maysdorf LBA Tract Proposed Action.

As discussed under Alternative 2, the Maysdorf LBA Tract consists of three non-contiguous blocks of federal coal. Under Alternative 3, the North Maysdorf LBA Tract would consist of the northernmost block of coal and the South Maysdorf LBA Tract would consist of the two southern blocks of coal, as shown in Figure 2-1b. BLM is considering dividing the tract because the north tract would potentially be of competitive interest to more than one mine.

As discussed under Alternative 2, BLM identified a study area in order to evaluate the potential that an alternate configuration of the Maysdorf LBA Tract would provide for more efficient recovery of the federal coal, increase competitive interest in the Maysdorf LBA Tract, and/or reduce the potential that some of the remaining unleased federal coal in this area would be bypassed in the future. The BLM study area, shown in Figure 2-1a, includes the tract as applied for and unleased federal coal adjacent to the western and southern edges of the tract as applied for. Under Alternative 3, the BLM could add some or all of the adjacent lands to the tract. Under this alternative, BLM could also reduce the size of the tract, as discussed in Section 2.0. The area BLM is evaluating in addition to the tract as applied for is described under alternative 2 and shown in Figure 2-1a.

In evaluating the study area, BLM has made a decision to include all of the area outside of the tract as applied for except Section 17, T.47N., R.71W. in the Maysdorf LBA Tract, if a decision is made to offer the tract for lease.

The lands that would be included in the north tract under BLM's preferred alternative are:

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 7: Lots 5, 12, 13, and 20;	167.53 acres
Section 8: Lots 3 through 6 and 11 through 13;	278.36 acres
Total:	445.89 acres

The lands that would be included in the south tract under BLM's preferred alternative are:

T.46N., R.71W., 6th P.M., Campbell County, Wyoming

Section 4: Lots 5 through 7, 10 through 15, and 18 through 20;	491.04 acres
Section 9: Lots 1 through 5;	204.50 acres
Section 10: Lots 1 through 6;	243.98 acres
Section 11: Lots 1 through 12;	487.28 acres

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 21: Lots 1 through 3, 6 through 11, and 14 through 16;	484.39 acres
Section 28: Lots 1 through 3, 6 through 11, and 14 through 16;	493.87 acres
Section 33: Lots 1 through 3, 6 through 11, and 14 through 16;	495.18 acres
Total:	2,900.24 acres

The BLM has determined that Leslie E. and Sandra K. Haight, who own surface lands included in the Maysdorf LBA Tract, meet the requirements listed under 43 CFR 3400.0-5gg and are therefore considered to be qualified surface owners. They own a ⅛ interest in the following lands:

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 33: Lots 1 through 3, 6, 7, and 8 (that part lying west of the east ROW line of the Hilight Road).

In the event that these qualified surface owners do not consent to leasing, the lands described above and shown in Figure 2-1b will be removed from the tract prior to holding a lease sale.

Under the Alternative 3 reconfiguration of the Maysdorf LBA Tract, the north tract would include approximately 445.89 acres containing approximately 52.8 million tons of in-place coal and the south tract would include 2,900.24 acres containing approximately 289.5 million tons of in-place coal, according to information provided by the applicant. As discussed under the Proposed Action and Alternative

2, not all of the coal included in the south tract would be recoverable due to the presence of the BNSF & UP railroad ROW and associated buffer zone. In addition, a portion of the southern tract lies within a "no-coal" zone. Although these lands would not be mined, they would be included in the south tract in order to:

- allow maximum recovery of all the mineable coal that is adjacent to but outside of the ROW and associated buffer zone;
- allow maximum recovery of all the mineable coal that surrounds the "no-coal" zone; and
- comply with the coal leasing regulations, which do not allow leasing of less than 10-acre aliquot parts.

Two Native American tribes have indicated they have concerns with disturbance of the cultural sites in this area, but no specific sites have been identified as traditional cultural properties by either tribe at this time. If one or both of these tribes identify specific sites that have special historical, cultural, religious or sacred significance to their tribes, appropriate action must be taken to address concerns related to those sites.

CMC estimates that approximately 49.6 million tons of coal would be produced from the 445.89-acre North Maysdorf LBA Tract and approximately 268 million tons of coal would be produced from the 2,900.24-acre South Maysdorf LBA Tract.

Under Alternative 3, CMC estimates that the average annual coal production would continue to be approximately 40 million tons, regardless of whether CMC acquires the north tract, the south tract, or both tracts as maintenance leases for the Cordero Rojo Mine. The life of the Cordero Rojo Mine would be extended by approximately three years, and the average number of employees would be approximately 448 persons if CMC acquires only the north tract as a maintenance lease. The life of the Cordero Rojo Mine would be extended by approximately nine years, and the average number of employees would be approximately 445 persons if CMC acquires only the south tract as a maintenance lease.

BLM has independently evaluated the volume and average quality of the coal resources included in the federal coal lands under consideration for leasing as part of the fair market value determination process. The fact that the coal within the railroad ROW and associated buffer zone would not be recovered and the presence of the "no-coal" zone was considered by BLM in evaluating the coal reserves included in the Maysdorf LBA Tract. BLM's estimate of the mineable federal coal reserves and average quality of the coal included in the two tracts does not necessarily agree with the mineable coal reserve and coal quality estimates provided by the applicant.

BLM's evaluation indicates that the North Maysdorf LBA Tract includes approximately 54.7 million tons of mineable coal. BLM's estimated average heating value of the coal in the North Maysdorf LBA Tract is approximately 8,585 Btu/lb, with an average of about 0.265 percent sulfur, 1.6 percent sodium, 4.4 percent ash, and 29 percent moisture.

BLM's evaluation indicates that the South Maysdorf LBA Tract includes approximately 288 million tons of mineable coal. BLM's estimated average heating value of the coal in the South Maysdorf LBA Tract is approximately 8,404 Btu/lb, with an average of about 0.285 percent sulfur, 1.5 percent sodium, 5.4 percent ash, and 29.7 percent moisture.

This information will be published in the sale notices for each tract, if they are offered for lease. Some additional general coal quality information in the area of the two tracts considered under this alternative is included in Section 3.3 of this document.

2.5 Alternative 4

Under this alternative, as under the Proposed Action, Alternative 2, and Alternative 3, the BLM would hold a separate, competitive, sealed-bid sale for the lands included in the Maysdorf LBA Tract. Alternative 4 assumes, however, that the successful qualified bidder would be someone other than the applicant and that this bidder would plan to open a new mine to develop the coal resources included in the Maysdorf coal lease application.

A company or companies acquiring this coal for a new stand-alone mine would require considerable initial capital expenses, including the construction of new surface facilities (i.e., offices, shops, warehouses, coal processing facilities, coal loadout facilities, and rail spur), extensive baseline data collection, and development of new mining and reclamation plans. In addition, a company or companies acquiring this coal for a new start mine would have to compete for customers with established mines in a competitive market.

BLM currently estimates that a tract would potentially need to include as much as 500 to 600 million tons of coal in order to attract a buyer interested in opening a new mine in the Wyoming PRB. This is based on the assumptions that: 1) an operator would construct facilities capable of producing 30 mmtpy to take advantage of the economies of scale offered by the coal deposits in the PRB and 2) 20 to 30 years of coal reserves would be needed to justify the expense of building the facilities described above. Given these assumptions, under the Proposed Action, Alternative 2, or Alternative 3, the tract does not include sufficient coal resources to consider opening a new mine. Therefore, it is unlikely that a company or companies would lease the Maysdorf LBA Tract in order to open a new mine.

The potential difficulty in obtaining an air quality permit is another issue that could discourage new mine starts in the PRB. A new mine would create a new source of air quality impacts. As discussed in Chapter 3, the WDEQ/AQD administers a permitting program to assist the agency in managing the state's air resources. Under this program, anyone planning to construct, modify, or use a facility capable of emitting designated pollutants into the atmosphere must obtain an air quality permit to construct. Coal mines fall into this category.

In order to obtain a construction permit, an operator may be required to demonstrate that the proposed activities will not increase air pollutant levels above annual standards established by the Wyoming Air Quality Standards and Regulations, which can be found on the Internet at website http://deq.state.wy.us/aqd/standards.asp. There were no exceedances of the 24-hour PM_{10} standards anywhere in the PRB through year 2000. From 2001 through 2005, there were 29 monitored exceedances of the 24-hour PM_{10} standard at seven operating mines in the Wyoming PRB, five of which are located within the southern portion of the basin. Nineteen of these exceedances occurred in 2001 and 2002, while two, three, and five exceedances occurred in 2003, 2004, and 2005, respectively (WDEQ/AQD 2006). Although none of the exceedances occurred at the Cordero Rojo Mine or at adjacent mines, they may make it more difficult for an operator planning on opening a new mine to demonstrate that new operations would not result in air pollution levels that are above annual Wyoming standards.

In view of the issues discussed above, development of a new mine on the Maysdorf LBA Tract is considered unlikely and this alternative is not analyzed in detail in this EIS.

The environmental impacts of developing a new mine to recover the coal resources in the Maysdorf LBA Tract would be greater than under the Proposed Action, the No Action Alternative, Alternative 2, or Alternative 3 because of the need for new facilities, new rail lines, new employment, and the creation of additional sources of particulates (dust). In the event that a lease sale is held and the applicant is not the successful bidder, the successful bidder would be required to submit a detailed mining and reclamation plan for approval before any of the tract could be mined, and this NEPA analysis would be reviewed and supplemented as necessary prior to approval of that mining and reclamation plan.

2.6 Alternative 5

Under Alternative 5, the BLM would delay the sale of the Maysdorf LBA Tract as applied for. The prices received for coal from the PRB have generally increased in recent years. If that trend continues, the bonus and royalty payments to the government might be higher if the tract is offered for sale at a later date. Also, delaying the sale of the tract would potentially allow more complete recovery of the CBNG resources prior to mining. Under this alternative, it is assumed that the tract could be developed later as a maintenance tract or a new start mine, depending on how long the sale was delayed.

There are two major sources of revenue to state and federal governments from the leasing and mining of federal coal: 1) the competitive bonus bid paid at the time the coal is leased, and 2) federal and state royalties and taxes collected when the coal is sold. Prices for PRB coal have been increasing since 2003. Damage to train tracks in Wyoming and other states limited coal shipments during much of 2005. These shipping constraints combined with increasing world energy demands and natural disasters in other parts of the country have led to increased coal prices. If coal prices continue to rise, this alternative could potentially increase the fair market value of the coal resources in the LBA tract, which could increase the bonus bid when the coal is leased. However, there is no assurance at this time that delaying the sale would result in a higher coal price or a higher bonus bid.

Even if the price does continue to rise, postponing a lease sale would not necessarily lead to higher royalty or tax income to the state or federal governments. Royalty and tax payments are the larger of the two revenue sources and they increase automatically when coal prices increase because they are collected at the time the coal is sold. They cannot be collected until the coal is leased and permitted and that takes several years. If leasing is delayed, then by the time the coal is mined, the higher coal prices may or may not persist. If the higher coal prices do persist, they may enable the coal lessee to negotiate longer term contracts at higher prices, which would result in longer term, higher royalty and tax revenues. On the other hand, if an existing mine runs out of coal reserves before prices rise, it would potentially have to shut down before additional coal could be leased and permitted for mining. Under that scenario, the fair market value of the coal could actually decrease because the added expense of reopening a mine or starting a new mine would have to be factored into the fair market value.

Other considerations include the value of leaving the mineable coal for future development versus the value of making low-sulfur coal available now, in anticipation of cleaner fuel sources being developed in the future. Continued leasing of PRB coal enables coal-fired power plants to meet CAA requirements without constructing new plants, revamping existing plants, or switching to existing alternative fuels, which may significantly increase power costs for individuals and businesses. If cleaner fuel sources are developed in the future, they could be phased in with less economic impact to the public.

A range of the potential future economic benefits of delaying leasing until coal prices rise could be quantified in an economic analysis, but the benefits would have to be discounted to the present, which would make them similar to the Action Alternatives.

CBNG resources are currently being recovered from oil and gas leases on the Maysdorf LBA Tract and there are several mechanisms in place that can be used to allow continuing recovery of the CBNG resources prior to mining if the federal coal in the tract is leased now. These include:

- BLM can attach a Multiple Mineral Development stipulation to the lease, which states that BLM has the authority to withhold approval of coal mining operations that would interfere with the development mineral leases issued prior to the coal lease.
- Mining of the Maysdorf LBA Tract cannot occur until the coal lessee has a permit to mine the tract approved by the WDEQ/LQD and a MLA mining plan approved by the Secretary of the Interior. Before the MLA mining plan can be approved, BLM must approve the R2P2 for mining the tract. Prior to approving the R2P2, BLM can review the status of CBNG development on the tract and the mining sequence proposed by the coal lessee. The permit approval process generally takes the coal lessee several years. This would allow time for a large portion of the CBNG resources to be recovered from the tract.
- BLM has a policy in place on CBNG-coal conflicts (BLM Instruction Memorandum No. 2006-153), which directs BLM decision makers to optimize the recovery of both resources and ensure that the public receives a reasonable return (BLM 2006a).

This alternative was not analyzed in detail because it would not produce substantially different impacts from other alternatives analyzed in detail. Rental and royalty provisions in the proposed lease provide for the U.S. to benefit if coal prices increase by the time of mining. Moreover, recovery of a large portion of the remaining economically-recoverable CBNG resources on the tract would be anticipated after lease issuance because of the mechanisms discussed above. The environmental impacts of mining the coal later as part of an existing mine would be expected to be similar and about equal to the Proposed Action and Alternatives 2 and 3. If a new mine start is required to mine the coal, the environmental impacts would be expected to be greater than if it were mined as an extension of an existing mine.

2.7 Summary of Alternatives and Environmental Consequences

2.7.1 Background

The decision-making process for public lands in Wyoming is conducted in compliance with NEPA, which requires all federal agencies to involve interested publics in their decision making, consider reasonable alternatives to the proposed actions, develop measures to mitigate environmental impacts, and prepare environmental documents that disclose the impacts of proposed actions and alternatives.

This draft EIS analyzes four different alternatives for the Maysdorf LBA Tract, described in the discussion above.

2.7.2 Summary of Alternatives

The locations of the Proposed Action and Alternatives 2 and 3 for the Maysdorf LBA Tract are shown on Figure 2-1a and 1b . A summary comparison of projected coal production, surface disturbance, mine life, and federal and state revenues for the Proposed Action and Alternatives 2 and 3 for the Maysdorf LBA Tract are presented in Table 2-2.

Table 2-3 presents a comparative summary of the direct and indirect environmental impacts of implementing each alternative as compared to the No Action Alternative. The No Action Alternative assumes completion of currently permitted mining at the Cordero Rojo Mine for comparison to anticipated mining if the Maysdorf LBA Tract is leased. Table 2-4 presents a comparative summary of cumulative environmental impacts of implementing each alternative. The environmental consequences of the Proposed Action and alternatives are analyzed in Chapters 3 and 4. These summary impact tables are derived from the following explanation of impacts and magnitude. NEPA requires all agencies of the federal government to include, in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on:

(i) the environmental impact of the Proposed Action,
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
(iii) alternatives to the Proposed Action,
(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
(v) any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented (42 USC § 4332[C]).

Impacts can be beneficial or adverse, and they can be a primary result of an action (direct) or a secondary result (indirect). They can be permanent, long-term (persisting beyond the end of mine life and reclamation) or short-term (persisting during mining and reclamation and through the time the reclamation bond is released). Impacts also vary in terms of significance. The basis for conclusions regarding significance are the criteria set forth by the Council on Environmental Quality (40 CFR1508.27) and the professional judgment of the specialists doing the analyses. Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to insignificance following completion of reclamation.

Table 2-2. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Revenues for Maysdorf LBA Tract and Cordero Rojo Mine.

Item	No Action Alternative (Existing Cordero Rojo Mine)	Added by Proposed Action	Added by Alternative 2	Added by Alternative 3 (Preferred Alternative)	
				North Tract	South Tract
In-Place Coal (as of 1/1/06)	388.1 mmt	234.8 mmt	342.3 mmt	52.8 mmt	289.5 mmt
Mineable Coal (as of 1/1/06)	388.1 mmt	230.3 mmt	337.9 mmt	52.8 mmt	285.0 mmt
Recoverable Coal (as of 1/1/06)[1]	364.8 mmt	216.5 mmt	317.6 mmt	49.6 mmt	268.0 mmt
Coal Mined Through 2005	650.3 mmt	—	—	—	—
Lease Area[2]	10,629.1 ac	2,219.4 ac	3,346.1 ac	445.9 ac	2,900.2 ac
Total Area To Be Disturbed[2]	14,694.0 ac	2,558.2 ac	4,024.7 ac	825.8 ac	3,198.9 ac
Permit Area[2]	16,804.4 ac	7,858.9 ac	7,858.9 ac	857.8 ac	7001.1 ac
Average Annual Post-2005 Coal Production	40.0 mmt	0 mmt	0 mmt	0 mmt	0 mmt
Remaining Life of Mine (post-2005)	9 yrs	6 yr	9 yr	3 yr	9 yr
Average Number of Employees	443	20	52	5	2
Total Projected State Revenues (post-2005)[3]	$412.5 million	$279.4 – $356.5 million	$409.8 - $523.0 million	$64.0 - $81.7 million	$345.8 – $441.3 million
Total Projected Federal Revenues (post-2005)[4]	$280.7 million	$201.2 - $278.3 million	$295.1 - $408.3 million	$46.1 - $63.8 million	$249.0 - $344.5 million

[1] Assumes 94 percent recovery of mineable coal. This figure excludes all coal that would not be mined beneath BNSF & UP railroad ROW and all mining losses that occur during normal mining operations.

[2] The lease area includes federal coal leases only and does not include state and private coal within the permit boundary. The disturbed area exceeds the leased area (total federal, state and private) because of the need for highwall reduction, topsoil removal, and other mine support activities outside the lease boundaries. The permit area is larger than the leased or disturbed area to assure that all disturbed lands are within the permit boundary and to allow an easily defined legal land description.

[3] Revenues to the State of Wyoming include severance taxes, property and production (Ad Valorum) taxes, sales and use taxes, and Wyoming's share of federal royalty payments, AML fees, and bonus bids. State revenues are based on $0.31 per ton estimate for severance taxes × amount of recoverable coal, plus $0.26 per ton estimate for Ad Valorum taxes × amount of recoverable coal, plus $0.023 per ton estimate for sales and use taxes × amount of recoverable coal, plus $5.80 per ton (projected for 8,400-Btu coal) price × amount of recoverable coal × federal royalty of 12.5 percent minus federal's 50 percent share, plus $0.35 per ton for AML fees × amount of recoverable coal minus federal's 50 percent share, plus bonus payment on LBA leased coal of $0.30 to $0.97 per ton (based on the range of bonus payments made for the last 6 LBAs sold in 2004 and 2005) × amount of mineable coal minus federal's 50 percent share.

[4] Federal revenues include black lung taxes and the federal government's share of federal royalty payments, AML fees, and bonus bids. Federal revenues are based on $5.80 per ton (projected for 8,400-Btu coal) price × amount of recoverable coal × black lung tax of 4.0 percent, plus $5.80 per ton (for 8,400-Btu coal) price × amount of recoverable coal × federal royalty of 12.5 percent minus state's 50 percent share, plus $0.35 per ton for AML fees × amount of recoverable coal minus state's 50 percent share, plus bonus payment on LBA leased coal of $0.30 to $0.97 per ton (based on the range of bonus payments made for the last 6 LBAs sold in 2004 and 2005) × amount of mineable coal minus state's 50 percent share.

Table 2-3. Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternatives 2 and 3, and the No Action Alternative for the Maysdorf LBA Tract[2].

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
TOPOGRAPHY & PHYSIOGRAPHY		
Lower surface elevation	Moderate, permanent on existing mine area	Same as No Action on expanded mine area
Permanent topographic moderation, which could result in:		
Microhabitat reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Habitat diversity reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Big game carrying capacity reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Reduction in water runoff and peak flows	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Increased precipitation infiltration	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Reduction in erosion	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Potential enhanced vegetative productivity	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Potential acceleration of groundwater recharge	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
GEOLOGY AND MINERALS		
Removal of coal	Moderate, permanent on existing mine area	Same as No Action on expanded mine area
Removal and replacement of topsoil and overburden	Moderate, permanent on existing mine area	Same as No Action on expanded mine area
Physical characteristic alterations in replaced overburden	Moderate, permanent on existing mine area	Same as No Action on expanded mine area
Loss of CBNG though venting and/or depletion of hydrostatic pressure	Moderate to substantial, permanent on existing mine area	Same as No Action on expanded mine area
Loss of access for development of sub-coal oil and gas resources and other minerals	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Destruction of paleontological resources that are not exposed on the surface	Moderate, permanent on the existing mine area	Same as No Action on expanded mine area
AIR QUALITY		
Particulate Emissions:		
Elevated concentrations associated with average production of 40 mmtpy in compliance with ambient standards	Moderate, short term on existing mine and surrounding area	Same as No Action on expanded mine and surrounding area for six to nine additional years
NO_x Emissions from Machinery:		
Elevated concentrations associated with average production of 40 mmtpy in compliance with ambient standard	Moderate, short term on existing mine and surrounding area	Same as No Action on expanded mine and surrounding area for six to nine additional years
NO_x Emissions from Blasting:		
Potential for public exposure	No reported events	No events projected
Visibility:		
Elevated concentrations of fine particulate matter associated with average production of 40 mmtpy	Moderate, short term on existing mine and surrounding area	Same as No Action on expanded mine and surrounding area for six to nine additional years
Acidification of Lakes:		
SO_2 emissions derived from burning Cordero Rojo coal to produce power	Moderate, short term	Same as No Action

---

[1] Refer to Chapter 3 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-3. Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternatives 2 and 3, and the No Action Alternative for the Maysdorf LBA Tract[2] (Continued).

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE AND DURATION OF IMPACT	
RESOURCE NAME	NO ACTION ALTERNATIVE	PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3
WATER RESOURCES		
GROUNDWATER		
Removal of coal and overburden aquifers	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Replacement of existing coal and overburden with unconsolidated backfill material	Moderate, permanent on existing mine area	Same as No Action on expanded mine area
Depressed water levels in overburden and coal aquifers adjacent to mine	Moderate, short to long term on existing mine and surrounding area	Same as No Action on expanded mine and surrounding area
Change in hydraulic properties in backfilled areas	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Increase in TDS concentrations in backfilled areas	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Use of subcoal aquifers for water supply	Negligible, short term on existing mine and surrounding area	Same as No Action on expanded mine and surrounding area
Decrease in water supply for groundwater-right holders within the five-foot drawdown area	Moderate, long term on existing mine and surrounding area	Same as No Action on expanded mine and surrounding area
SURFACE WATER		
Diversion and disruption of surface drainage systems	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Reconstruction of surface drainage systems	Permanent on existing mine areas	Same as No Action on expanded mine area
Increased runoff and erosion rates on disturbed lands due to vegetation removal	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased infiltration on reclaimed lands due to topographic moderation	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Increased runoff on reclaimed lands due to loss of soil structure	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Potential for adverse downstream effects as a result of sediment produced by large storms	Moderate, long term for existing approved mining operation	Same as No Action on expanded mining operation
ALLUVIAL VALLEY FLOORS		
While final determinations have not been made by WDEQ/LQD, it is believed that there are no AVFs significant to agriculture on the proposed lease tract		
Removal and restoration of AVFs determined not to be significant to agriculture	Moderate, short term on existing leases	Same as No Action on expanded mine area
Disruptions to streamflows supplying downstream AVFs	Negligible, short term on existing leases	Same as No Action on expanded mine area
WETLANDS		
Removal of jurisdictional wetlands and loss of wetland function until reclamation occurs	Moderate, short term on existing leases; jurisdictional wetlands would be replaced as required under Section 404 of the Clean Water Act	Same as No Action on expanded mine area
Removal of non-jurisdictional wetlands and loss of wetland function until reclamation occurs	Moderate, short term to long term on existing leases; non-jurisdictional wetlands would be replaced as required by the surface land owner or WDEQ/LQD	Same as No Action on expanded mine area

---

[1] Refer to Chapter 3 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-3. Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternatives 2 and 3, and the No Action Alternative for the Maysdorf LBA Tract[2] (Continued).

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	*MAGNITUDE AND DURATION OF IMPACT*	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
SOILS		
Changes in physical properties after reclamation would include:		
Increased near-surface bulk density and decreased soil infiltration rate resulting in increased potential for soil erosion	Moderate, long term on existing mine area	Same as No Action on expanded mine area
More uniformity in soil type, thickness, and texture	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Decreased runoff due to topographic modification	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Changes in biological properties in soils that are stockpiled before reclamation would include:		
Reduction in organic matter	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Reduction in microorganism population reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Reduction in organic matter in soils stockpiled before placement	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Changes in chemical properties would include:		
More uniform soil nutrient distribution	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
VEGETATION		
During mining:		
Progressive removal of existing vegetation	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased erosion	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Wildlife habitat and livestock grazing loss	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Potential invasion of non-native plant species	Moderate, short term on existing mine area	Same as No Action on expanded mine area
After revegetation:		
Changes in vegetation patterns	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Reduction in vegetation diversity	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Reduction in shrub density	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Decreased big game habitat carrying capacity	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Decreased habitat for shrub dependent species	Moderate, long term on existing mine area	Same as No Action on expanded mine area
WILDLIFE		
Big game displacement from active mining areas	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased competition on adjacent undisturbed or reclaimed lands, especially big game	Moderate, short term on adjacent area	Same as No Action on adjacent area
Restriction of wildlife movement, especially big game	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased mortality of small mammals	Moderate, short term on existing mine area	Same as No Action on expanded mine area

---

[1] Refer to Chapter 3 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-3. Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternatives 2 and 3, and the No Action Alternative for the Maysdorf LBA Tract[2] (Continued).

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
WILDLIFE (Continued)		
Displacement of small and medium-sized mammals	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Surface and noise disturbance of active sage grouse leks	Moderate, short to long term on existing mine area	Same as No Action on expanded mine area
Disturbance of sage grouse nesting habitat during mining	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Loss of sage grouse nesting habitat after reclamation	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Alteration of plant and animal communities after reclamation	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Abandonment of raptor nests	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Loss of foraging habitat for raptors	Negligible, short to long term on existing mine area	Same as No Action on expanded mine area
Loss of nesting and foraging habitat for Migratory Birds of Management Concern	Negligible, short to long term on existing mine area	Same as No Action on expanded mine area
Reduction in waterfowl resting and feeding habitat	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Loss of habitat for aquatic species during mining	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Road kills by mine-related traffic	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Reduction in habitat carrying capacity and habitat diversity on reclaimed lands	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Potential reduction in microhabitats on reclaimed lands	Moderate, long term on existing mine area	Same as No Action on expanded mine area
THREATENED, ENDANGERED, PROPOSED, AND CANDIDATE SPECIES (See Appendix F)		
Black-footed ferrets	As determined by previous consultation with USFWS for all species	No effect
Bald eagle		May affect, not likely to adversely affect
Ute ladies'-tresses		May affect, not likely to adversely affect
LAND USE AND RECREATION		
Reduction of livestock grazing	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Loss of wildlife habitat	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Loss of access for sub-coal oil and gas development	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Removal of oil and gas production facilities	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Loss of access to public land available for recreation and grazing	Moderate, short term on existing mine area	Same as No Action on expanded mine area
CULTURAL RESOURCES		
Sites that are not eligible for NRHP	Ineligible sites may be destroyed without further work	Same as No Action on expanded mine area
Sites that are eligible for NRHP	Impacts to sites that are eligible for the NHRP are not permitted; eligible sites would be avoided or mitigated through data recovery prior to mining	Same as No Action on expanded mine area
Sites that are unevaluated for eligibility	Impacts to unevaluated sites are not permitted; unevaluated sites would be evaluated prior to mining	Same as No Action on expanded mine area

[1] Refer to Chapter 3 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-3. Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternatives 2 and 3, and the No Action Alternative for the Maysdorf LBA Tract[2] (Continued).

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
NATIVE AMERICAN CONCERNS	No impact identified on existing mine area	Same as No Action on expanded mine area
VISUAL RESOURCES		
During mining:		
Alteration of landscape by mining facilities and operations	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Following reclamation:		
Smoother sloped terrain	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Reduction in sagebrush density	Moderate, short to long term on existing mine area	Same as No Action on expanded mine area
NOISE		
Increased noise levels	Moderate to substantial, short term on existing mine, surrounding area and occupied dwellings within one mile	Same as No Action on expanded mine area, no occupied dwellings within one mile of LBA tract
TRANSPORTATION FACILITIES		
Use of railroads to ship coal	Moderate, for duration of existing approved mining operations	Same as No Action for additional six to nine years
Employee and service contractor use of highways to and from mine sites	Moderate, for duration of existing approved mining operations	Same as No Action for additional six to nine years
Relocation of pipelines	Negligible, short to long term on existing mine area	Same as No Action on expanded mine area
Relocation of utility lines	Negligible, short to long term on existing mine area	Same as No Action on expanded mine area
Relocation of county roads to recover coal under lease	Moderate, long term to permanent on existing mine area	Same as No Action on expanded mine area
SOCIOECONOMICS		
Employment	Moderate, beneficial short term for existing approved mining operations	20 to 52 potential additional if mine life extended
Revenues from royalties and taxes to the state and local government	Moderate, beneficial short term on existing mine area	Same as No Action for additional six to nine years
Revenues from royalties and taxes to the federal government	Moderate, beneficial short term on existing mine area	Same as No Action for additional six to nine years
Economic development	Moderate, beneficial short term on existing mine area	Same as No Action for additional six to nine years
Additional housing and infrastructure needs	No new impact related to existing mine area	Same as No Action on expanded mine area

[1] Refer to Chapter 3 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-4. Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2].

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	*MAGNITUDE, TYPE, AND DURATION OF IMPACT*	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
TOPOGRAPHY & PHYSIOGRAPHY		
Alteration of topography following reclamation of coal disturbance areas	Permanent topographic moderation following reclamation	Same as No Action
Alteration of topography to accommodate coal-related, oil and gas, and oil- and gas-related facilities	Long term to permanent	Same as No Action
GEOLOGY AND MINERALS		
Recovery of coal resulting in reduction in coal resources and disturbance and replacement of overburden and topsoil	Moderate, long term to permanent	Same as No Action
Surficial disturbance and reclamation on oil and gas well sites and associated facilities	Moderate, long term to permanent	Same as No Action
PALEONTOLOGY		
Coal, coal-related, oil and gas, and oil- and gas-related development disturbance of PFYC Class 5 Wasatch and Class 3 Fort Union Formations	Permanent potential adverse effects to scientifically significant fossils that are present but not visible prior to disturbance	Same as No Action
AIR QUALITY		
Impacts to Montana near-field receptors		
- 24-hour PM_{10}	A maximum modeled impact in one area above NAAQS for the baseline year and both coal production scenarios for 2010	Same as No Action
- All other parameters	Modeled impacts in compliance with NAAQS and Montana AAQS	Same as No Action
Impacts to Wyoming near-field receptors - 24-hour PM_{10}	Modeled impact above NAAQS at some receptors for both coal production scenarios for 2010	Same as No Action
- Annual PM_{10}	Maximum modeled impact above NAAQS at one receptor for the upper production scenario for 2010	Same as No Action
- All other parameters	Modeled impacts in compliance with NAAQS and Wyoming AAQS	Same as No Action

---

[1] Cumulative impact discussion in this table and in Chapter 4 is based on the PRB Coal Review analyses (BLM 2005a-f, 2006b).

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-4. Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2] (Continued).

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE, TYPE, AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
AIR QUALITY (Continued)		
Non-regulatory PSD Impacts at Class I and Sensitive Class II Areas		
- Class I Northern Cheyenne Indian Reservation	Modeled impacts above Class I increment levels for 24-hour PM_{10}, annual PM_{10}, 24-hour SO_2, 3-hour SO_2 for baseline year and both coal production scenarios for 2010; above Class I increment for annual NO_2 for upper coal production scenario for 2010	Same as No Action
- Class I Washakie Wilderness Area and Wind Cave National Park and Class II Crow Indian Reservation	Modeled impacts above Class I increment levels for 24-hour PM_{10} for baseline year and both coal production scenarios for 2010	Same as No Action
- All other Class I and Sensitive Class II modeled receptors	Modeled impacts within Class I increment levels for baseline year and both coal production scenarios for 2010	Same as No Action
Visibility Impacts	199 or more days with a change of 1.0 dv or greater at three Class I areas and seven sensitive Class II areas for the baseline year and both coal productions scenarios	Same as No Action
Acid deposition Impacts	All modeled impacts below the depositions threshold values for nitrogen and sulfur compounds	Same as No Action
- Florence Lake	Modeled impact above 10 percent ANC	Same as No Action
- Upper Frozen Lake	Modeled impact above 1 μeq/L	Same as No Action
- All other modeled sensitive lakes	Modeled impact below threshold values	Same as No Action
GROUNDWATER RESOURCES		
Removal of coal aquifer and replacement with backfill material	Moderate, permanent for mining areas	Same as No Action
Lowering of water levels in aquifers around the mines	Moderate, long term in area immediately west of mines	Same as No Action
Water level decline in sub-coal aquifers as a result of all development	No cumulative impacts anticipated	Same as No Action
Change in groundwater quality as a result of all development	No cumulative impacts anticipated	Same as No Action

---

[1] Cumulative impact discussion in this table and in Chapter 4 is based on the PRB Coal Review analyses (BLM 2005a-f, 2006b).

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-4. Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2] (Continued).

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE, TYPE, AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
GROUNDWATER RESOURCES (Continued)		
Overlapping drawdown in the coal aquifer caused by surface mining and CBNG development	Additive, long term in area immediately west of surface coal mines	Same as No Action
SURFACE WATER RESOURCES		
Surface disturbance of intermittent and ephemeral streams and scattered ponds and reservoirs as a result of coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short term	Same as No Action
Discharge of coal mining and CBNG produced waters into intermittent and ephemeral streams	Moderate, short term	Same as No Action
Sediment input into intermittent and ephemeral streams and scattered ponds and reservoirs as a result of coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short term	Same as No Action
ALLUVIAL VALLEY FLOORS		
Coal mining disturbance of AVFs determined to be significant to agriculture	Not permitted by regulation	Same as No Action
Coal mining disturbance of AVFs determined not to be significant to mining	AVFs disturbed by mining must be restored to essential hydrologic function No cumulative impacts anticipated	Same as No Action
SOILS		
Coal mining, coal-related, oil and gas, and oil- and gas-related disturbance and replacement of soil resources	Moderate, short term and long term impacts through accelerated wind or water erosion, declining soil quality factors through compaction, reduced microbial populations and organic matter, and potential mixing of soil zones	Same as No Action
CBNG water disposal impacts to soil resources	Potential increase in soil alkalinity depending on SAR levels in water and method of water disposal	Same as No Action

---

[1] Cumulative impact discussion in this table and in Chapter 4 is based on the PRB Coal Review analyses (BLM 2005a-f, 2006b).

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-4. Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2] (Continued).

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE, TYPE, AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
VEGETATION		
Coal mining, coal-related, oil and gas, and oil- and gas-related removal and replacement of native vegetation	Moderate, short to long term impacts due to potential differences in species composition and presence and size of woody species on reclaimed lands	Same as No Action
Coal mining, coal-related, oil and gas, and oil- and gas-related impacts to Special Status Plant Species	Potential incremental loss of alteration of potential of known habitat	Same as No Action
Coal mining, coal related, oil and gas, and oil- and gas-related dispersal of noxious and invasive species	Potential displacement of native species and changes in species composition	Same as No Action
WETLAND AND RIPARIAN VEGETATION		
CBNG-related discharge of produced water	Moderate, short to long term creation of wetlands in areas that previously supported upland vegetation	Same as No Action
WILDLIFE		
Direct and indirect coal mining, coal-related, oil and gas, and oil- and gas-related development impacts to game and non-game species, including direct mortality, habitat fragmentation, animal displacement, noise and increased human presence	Moderate, short term	Same as No Action
Coal mining, coal-related, oil and gas, and oil- and gas-related disturbance of game and nongame species habitat during project development and operation	Moderate, short term loss of all types of habitat present in disturbed areas	Same as No Action
Coal mining, coal related, oil and gas, and oil- and gas-related habitat changes after reclamation	Moderate, long term change in habitat with potential changes in associated wildlife populations	Same as No Action
FISHERIES		
Alteration or loss of habitat due to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short to long term	Same as No Action
Changes in water quality as a result of surface disturbance or introduction of contaminants into drainages caused by coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short to long term	Same as No Action

---

[1] Cumulative impact discussion in this table and in Chapter 4 is based on the PRB Coal Review analyses (BLM 2005a-f, 2006b).

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-4. Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2] (Continued).

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	*MAGNITUDE, TYPE, AND DURATION OF IMPACT*	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
FISHERIES (Continued)		
Changes in available habitat as a result of water withdrawals or discharges related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short term	Same as No Action
SPECIAL STATUS SPECIES		
Direct and indirect coal mining, coal-related, oil and gas, and oil- and gas-related development impacts, including direct mortality, breeding area, nest, or burrow abandonment, noise and increased human presence	Moderate, short term	Same as No Action
Coal mining, coal-related, oil and gas, and oil- and gas-related disturbance of habitat during project development and operation	Moderate, short term loss of all types of special status species habitat present in disturbed areas	Same as No Action
Coal mining, coal related, oil and gas, and oil- and gas-related habitat changes after reclamation	Moderate, long term change in habitat with potential changes in associated populations of special status species	Same as No Action
LAND USE AND RECREATION		
Loss of forage and range improvements and restriction of livestock movement due to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short term	Same as No Action
Disturbance of developed recreation sites by coal mining, coal-related, oil and gas, and oil- and gas-related development	Negligible, short term	Same as No Action
Reduction or degradation of opportunities for dispersed recreation activities related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short term on existing mine area	Same as No Action
CULTURAL RESOURCES		
Disturbance of cultural resource sites	Moderate, permanent	Same as No Action
TRANSPORTATION AND UTILITIES		
Movement of segments of existing highways, pipelines, transmission lines, or railroads to accommodate coal mining development	Moderate, long term to permanent, disruptive effects would be minimized	Same as No Action

---

[1] Cumulative impact discussion in this table and in Chapter 4 is based on the PRB Coal Review analyses (BLM 2005a-f, 2006b).

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-4. Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2] (Continued).

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE, TYPE, AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 and ALTERNATIVE 3**
TRANSPORTATION AND UTILITIES		
Increased vehicular traffic on roads and highways due to coal mining, coal-related, oil and gas, and oil- and gas-related development, and associated impacts including traffic accidents, road wear, air emissions, dust, noise, and vehicle collisions with wildlife and livestock	Moderate, short term	Same as No Action
Construction and operation of additional railroad and pipeline facilities and transmission lines to transport coal, oil and gas, and electricity	Moderate, short to long term	Same as No Action
SOCIOECONOMICS		
Increases in employment related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Significant, short to long term	Same as No Action
Increases in personal income due to employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Significant, beneficial, short to long term	Same as No Action
Increase in population due to employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Significant, short to long term	Same as No Action
Expansion of housing supply due to employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Significant, short to long term	Same as No Action
Increases in school enrollment due to employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short term	Same as No Action
Need for additional local government facilities and services due to employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short to long term	Same as No Action
Increased federal state and local revenues related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Significant, beneficial, short to long term	Same as No Action

---

[1] Cumulative impact discussion in this table and in Chapter 4 is based on the PRB Coal Review analyses (BLM 2005a-f, 2006b).

[2] All impacts are assumed to be adverse unless noted otherwise.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources in the general analysis area for the Maysdorf LBA[1] Tract (the affected environment) and analyzes the direct and indirect impacts to those resources that would be associated with mining the tract if it is leased under the Proposed Action or Alternatives 2 or 3 (the environmental consequences). The probable environmental consequences of the No Action Alternative (Alternative 1, not issuing a lease for the tract) with respect to each of the environmental resources are also considered in this analysis.

Additional, more detailed information about the affected environment in the general analysis area is contained in a separate document entitled *Supplementary Information on the Affected Environment in the General Analysis Area for the Maysdorf Coal Lease Application EIS*, which is available on request.

This chapter also considers regulatory compliance, mitigation, monitoring, residual impacts, the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and the irreversible and irretrievable commitments of resources that would occur with implementation of the Proposed Action or Alternatives 2 and 3. As discussed in Chapter 2, regulatory compliance and mitigation and monitoring measures that are required by federal and/or state law are considered to be part of the Proposed Action and Alternatives 2 and 3.

Critical elements of the human environment (BLM 1988) that could potentially be affected by the Proposed Action or Alternatives 2 and 3 include air quality, cultural resources, Native American religious concerns, T&E species, migratory birds, hazardous or solid wastes, water quality, wetlands/riparian zones, floodplains, invasive non-native species, and environmental justice. Four other critical elements (areas of critical environmental concern, prime or unique farmlands, wild and scenic rivers, and wilderness) are not present in the analysis area and are not addressed further. In addition to the critical elements that are potentially present in the general analysis area, this EIS discusses the status and potential effects of mining the LBA tract on topography and physiography, geology and mineral resources, soils, water quantity, alluvial valley floors, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics. The resources that are addressed in this EIS were identified during the scoping process or interdisciplinary team review as having the potential to be affected.

---

[1] Refer to page xv for a list of abbreviations and acronyms used in this document.

Figure 3-1 shows the general analysis area for most environmental resources. The general analysis area for the tract includes the BLM study area for the Maysdorf LBA Tract (the tract as applied for and the additional area evaluated under Alternatives 2 and 3), and the anticipated permit amendment study area for the Cordero Rojo Mine. The anticipated permit amendment study area is defined as those lands adjacent to and outside of the mine's current permit area that the applicant anticipates would be included within the amended mine permit area if they acquire the tract.

Table 3-1 shows the acreage leased and disturbance area for the existing Cordero Rojo Mine (which represents the No Action Alternative), and how the leased area and disturbance area would change under the Action Alternatives. A portion of the LBA tract lies inside the current mine permit area (Figure 3-1). If the tract is leased, the area that would have to be added to the existing mine permit area would be that portion of the LBA tract that lies outside the existing permit boundary plus an adjacent strip of land that would be used for highwall reduction after mining and such mine-related activities as construction of diversions, flood and sediment control structures, roads, and stockpiles. Portions of the LBA tract that are contiguous to the existing mine will be disturbed under the current mining plans in order to recover the coal in the existing coal leases. The environmental consequences of implementing the Proposed Action or Alternatives 2 and 3 would be similar in nature, but selection of the Proposed Action would disturb a smaller area of land surface.

Surface mining and reclamation have been ongoing in the eastern PRB for over two decades. During this time, effective mining and reclamation technologies have been developed and continue to be refined. Mining and reclamation operations are regulated under SMCRA and Wyoming statutes. WDEQ technically reviews all mine permit application packages to ensure that the mining and reclamation plans comply with all state permitting requirements and that the proposed coal mining operations comply with the performance standards of the DOI-approved Wyoming program. BLM attaches special stipulations to all coal leases (Appendix D), and there are a number of federal and state permit approvals that are required in order to conduct surface mining operations (Appendix A). The regulations are designed to ensure that surface coal mining impacts are mitigated.

Impacts can range from beneficial to adverse and they can be a primary result of an action (direct) or a secondary result (indirect). They can be permanent, long-term (persisting beyond the end of mine life and reclamation), or short-term (persisting during mining and reclamation and until the time the reclamation bond is released). Impacts also vary in terms of significance. The basis for conclusions regarding significance are the criteria set forth by the Council on Environmental Quality (40 CFR 1508.27) and the professional judgment of the specialists doing the

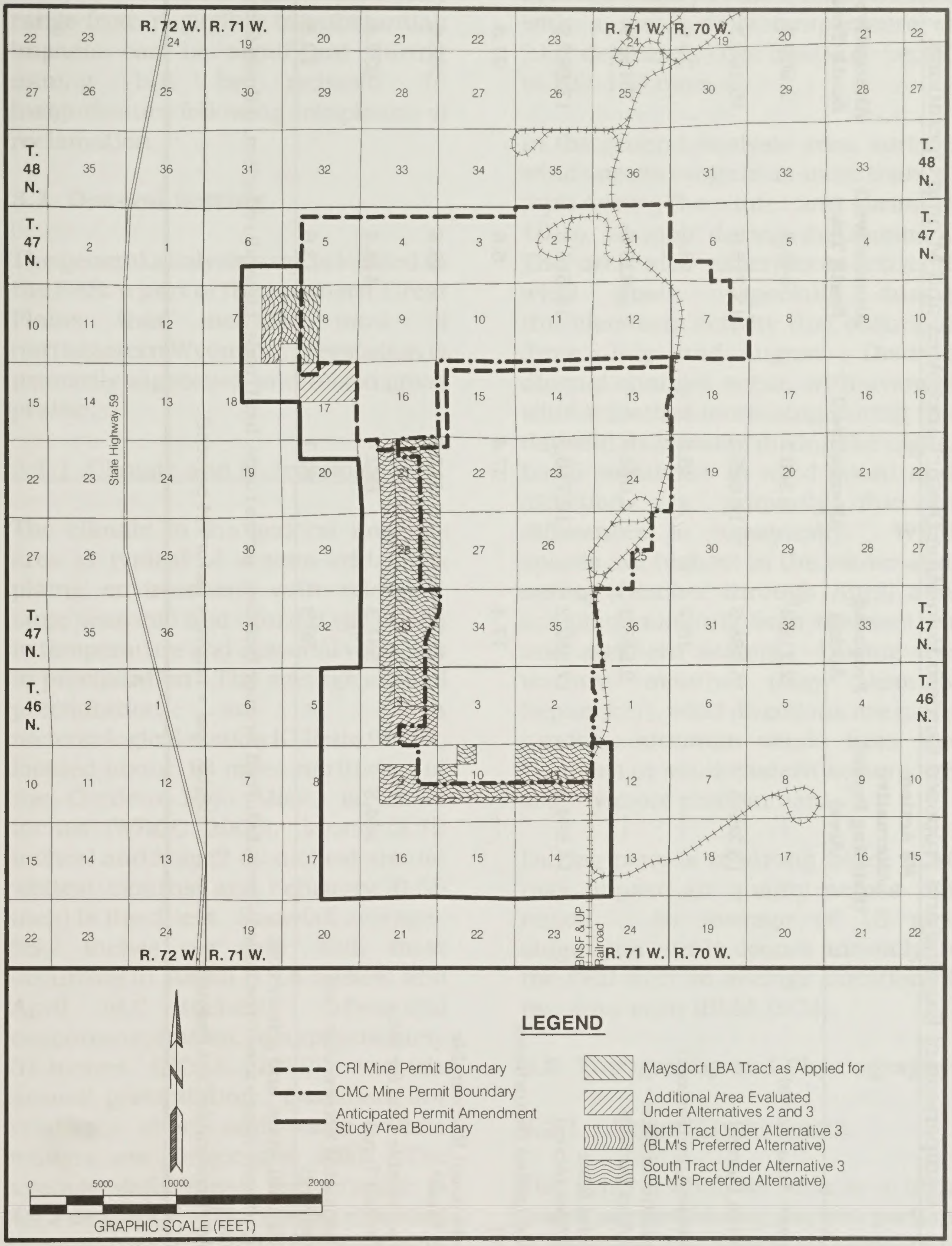

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
State Highway 59
BNSF & UP Railroad
LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Anticipated Permit Amendment Study Area Boundary
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure 3-1. General Analysis Area.

Table 3-1. Comparison of Existing and Proposed Cordero Rojo Mine Disturbance Area and Mining Operations.

	No Action Alternative (Existing Permit Area)	**Proposed Action**	**Alternative 2**	**Alternative 3 North Tract**	**Alternative 3 South Tract**
Additional Lease Area (Acres)	---	2,219.4	3,346.1	445.9	2,900.2
Total Lease Area (Acres)[1]	13,269.1	15,488.5	16,615.2	13,715.0	16,169.3
Increase in Lease Area (Percent)	---	16.7	25.2	3.4	21.9
Estimated Additional Mine Disturbance Area (Acres)[2]	---	2,558.2	4,024.7	825.8	3,198.9
Estimated Total Mine Disturbance Area (Acres)	14,694.0	17,252.2	18,718.7	15,519.8	17,892.9
Increase in Estimated Disturbance Area (Percent)	---	17.4	27.4	5.6	21.8
Estimated Additional Recoverable Coal (Million Tons)[3]	---	216.5	317.6	49.6	268.0
Estimated Recoverable Coal for Mine as of 1/06 (Million Tons)	364.8	581.3	682.4	414.4	632.8
Increase in Estimated Recoverable Coal as of 1/06 (Percent)	---	59.3	87.1	13.6	73.5

[1] Includes federal, state, and private coal.

[2] Total Disturbance Area = area to be mined + area disturbed for mine facilities, access roads, haul roads, highwall reduction, railroad facilities, stockpiles, etc.

[3] Estimated Recoverable Coal Resources = tons of mineable coal × recovery factor (94 percent).

analyses. Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to insignificance following completion of reclamation.

3.1 General Setting

The general analysis area is located in the PRB, a part of the Northern Great Plains that includes most of northeastern Wyoming. Vegetation is primarily sagebrush and mixed grass prairie.

3.1.1 Climate and Meteorology

The climate in the general analysis area is typical of a semi-arid, high plains environment with relatively large seasonal and diurnal variations in temperature and seasonal variation in precipitation. The average annual precipitation at a NOAA meteorological station (Gillette 9ESE), located about 18 miles northwest of the Cordero Rojo Mine, is 15.64 inches (WRCC 2006). June (2.72 inches) and May (2.60 inches) are the wettest months, and February (0.55 inch) is the driest. Snowfall averages 56.7 inches per year, with most occurring in March (10.4 inches) and April (8.6 inches). Potential evapotranspiration, at approximately 31 inches (NOAA 1969), exceeds annual precipitation. Summers are relatively short and warm, while winters are longer and cold. The average daily mean temperature is 45.2 degrees F. The highest recorded temperature was 107 degrees F and the lowest was minus 40 degrees F. July is the warmest month, with a mean daily temperature of 71 degrees F, and January is the coldest month, with a mean daily temperature of 21.7 degrees F. The frost-free period is 100-130 days.

In the general analysis area, surface wind speeds range from more than 30 mph during the winter and spring to 10 to 12 mph during the summer. The area also experiences extreme wind gusts, especially during thunderstorm activity that occurs in June, July, and August. Distinct diurnal changes occur, with average wind velocities increasing during the day and decreasing during the night. Local variations in wind speed and direction are primarily due to differences in topography. Wind speeds are highest in the winter and spring (October through April) and are predominantly from the western and northern sectors. During the warmer months (May through September), wind directions are more random, although winds from the northern or southeastern sectors are slightly more predominant.

During periods of strong wind, dust may impact air quality across the region. An average of 15 air-stagnation events occurs annually in the PRB with an average duration of two days each (BLM 1974).

3.2 Topography and Physiography

3.2.1 Affected Environment

The general analysis area is a high plains area within the eastern portion of the PRB. The PRB is an elongated, asymmetrical structural downfold that is bounded by the Black Hills on the east; the Big Horn Mountains on the west; the Hartville Uplift, Casper Arch, and Laramie Mountains on the south; and the Miles City Arch and the Yellowstone River on the north. The Cordero Rojo Mine is located on the gently dipping eastern limb of the structural downfold. The regional dip in the area of the mine is to the west.

Landforms of the area consist of a dissected rolling upland plain with low relief, broken by low red-capped buttes, mesas, hills, and ridges. Playas are common in the basin, as are buttes and plateaus capped by clinker or sandstone. Elevations in the PRB range from less than 2,500 ft to greater than 6,000 ft above sea level. The major river valleys have wide, flat floors and broad floodplains. The drainages dissecting the area are incised, typically are ephemeral or intermittent, and do not provide year-round water sources.

The general analysis area is drained by the Belle Fourche River, which is the most prominent topographic feature. The topography is comprised of the Belle Fourche River bottomlands, rough breaks, and gently rolling uplands. Elevations range from about 4,510 ft to 4,770 ft above sea level and slopes range from flat to around 40 percent. Predominant habitat types within the LBA tract and adjacent area consist of sagebrush-grassland with areas of upland-grassland. Rough breaks and bottomland or riparian areas occur in the southern portion. The Belle Fourche River passes through the southern part of the tract from west to east. Overall, the Maysdorf LBA Tract is similar in topography to the rest of the Cordero Rojo Mine permit area.

3.2.2 Environmental Consequences

3.2.2.1 Proposed Action and Alternatives 2 and 3

Surface coal mining would permanently alter the topography of the LBA tract if it is leased and mined. Topsoil would be removed from the land and stockpiled or placed directly on recontoured areas. Overburden would be blasted and stockpiled or directly placed into the already mined pit, and coal would be removed. The existing topography on the LBA tract would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. If necessary, the Belle Fourche River would be diverted into a temporary channel to prevent pits from being flooded.

Typically, a direct permanent impact of coal mining and reclamation is topographic moderation. After reclamation, the restored land surfaces are generally gentler, with more uniform slopes and restored basic drainage networks. The original topography of the Maysdorf LBA Tract ranges from relatively flat to gently rolling hills. Slopes range from flat to around 40 percent, as discussed above, and the average slope is about four to five percent. The expected postmining topography would be similar to the premining topography, but somewhat gentler and more uniform. Following reclamation, the average surface elevation on the LBA tract as proposed would be approximately 20.5 ft lower due to coal removal. The removal of the coal would be partially offset by the swelling that occurs when the overburden (and interburden, if present) is blasted and removed. Table 3-2 presents the approximate postmining surface elevation change for the LBA tract as applied for under the Proposed Action and Alternatives 2 and 3. After the coal is removed, the land surface would be restored to approximate original contour or to a configuration approved by WDEQ/LQD when the mining and reclamation permit for the existing mine is amended to include coal removal from the LBA tract.

Direct adverse impacts resulting from topographic moderation include a reduction in microhabitats (e.g., cutbank slopes) for some wildlife species and a reduction in habitat diversity, particularly a reduction in slope-dependent shrub communities and associated habitat. These impacts, which would be greater in those areas characterized as rough breaks, may result in a long-term reduction in the carrying capacity for some species. A direct beneficial impact of the lower and flatter terrain would be reduced water runoff, which would allow increased infiltration and result in a minor reduction in peak flows. This may help counteract the potential for increased erosion that could occur as a result of higher near-surface bulk density of the reclaimed soils (Section 3.8.2). It may also increase vegetative productivity, and potentially accelerate recharge of groundwater.

The approximate original drainage pattern, including the diverted portion of the Belle Fourche River, would be restored. Stockponds and playas would be replaced to provide livestock and wildlife watering sources. These topographic changes would not conflict with regional land use, and the postmining topography

Table 3-2. Comparison of Average Overburden and Coal Thicknesses and Approximate Postmining Surface Elevation Changes Under the No Action and Action Alternatives.

	No Action Alternative (Existing Leases)	**Proposed Action (As Applied For LBA Tract)**	**Alternatives 2 and 3**
Average Overburden Thickness (ft)	140.0	222.0	238.5
Average Coal Thickness (ft)	60.0	62.1	61.9
Swell Factor (percent)	17	17	17
Coal Recovery Factor (percent)	94	94	94
Postmining Elevation Change[1]	32.6 ft lower	20.5 ft lower	17.6 ft lower

[1] Reclaimed (postmining) elevation surface change calculated as: (coal thickness × coal recovery factor) – (swell factor × overburden thickness).

would be designed to adequately support anticipated land use.

These impacts are occurring on the existing Cordero Rojo Mine coal leases as coal is mined and mined-out areas are reclaimed. Under the Proposed Action or Alternatives 2 and 3, the areas that would be permanently topographically changed would increase as shown in Table 3-1.

3.2.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal would not occur on the LBA tract. Mining operations and the associated impacts to topography and physiography would continue as permitted on the existing Cordero Rojo Mine leases. Table 3-2 presents the approximate postmining surface elevation change for the existing mine. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.2.3 Regulatory Compliance, Mitigation and Monitoring

The mined-out area must be restored to approximate original contour or other topographic configuration approved by WDEQ/LQD. The topographic configuration would be developed and approved as part of the required mining and reclamation plan for the Cordero Rojo Mine. WDEQ/LQD monitors topographic restoration by checking the as-built topography in the annual report filed by the mine to see if it conforms to the approved topography.

3.2.4 Residual Impacts

Topographic moderation is a permanent consequence of mining. The indirect impacts of topographic moderation on wildlife habitat diversity would also be considered permanent.

3.3 Geology, Mineral Resources, and Paleontology

3.3.1 General Geology and Coal Resources

3.3.1.1 Affected Environment

Stratigraphic units that would be impacted if the tract under consideration for leasing is mined include, in descending order, recent (Quaternary age) alluvial and eolian deposits, the Eocene age Wasatch Formation (the overburden), and the Paleocene age Fort Union Formation (which contains the target coal seam). Figure 3-2 is a chart showing the stratigraphic relationships of the surface and subsurface geologic units in the general analysis area. Additional information about these units is included in the Groundwater section of this document (Section 3.5).

Surficial deposits in the general analysis area include alluvial and eolian deposits and weathered

Geologic Unit		Hydrologic Characteristics
RECENT ALLUVIUM HOLOCENE		Typically fine grained and poorly sorted sands interbedded with silts and clays in ephemeral drainages. Occasional, very thin, clean, interbedded sand lenses. More laterally extensive, thicker, and coarse-grained along the larger stream courses. Excessive dissolved solids generally make this aquifer unsuitable for domestic and agricultural use and marginal for livestock (Class III) use standards. Low infiltration capacity in ephemeral draws unless covered by sandy eolian blanket.
CLINKER HOLOCENE TO PLEISTOCENE		Baked and fused bedrock resulting from burning coal seams which ignite on the outcrop from lightning, manmade fires or spontaneous combustion. The reddish clinker (locally called scoria, red dog, etc.) formed by melting and partial fusing of overburden above the burning coal. The baked rock varies greatly in the degree of alteration; some is dense and glassy while some is vesicular and porous. It is commonly used as a road construction material and is an aquifer wherever saturated. Considered to be part of the Wasatch Formation.
WASATCH FORMATION EOCENE		Lenticular fine sands interbedded in predominantly very fine-grained siltstone and claystone may yield low to moderate quantities of poor to good quality water. The discontinuous nature and irregular geometry of these sand bodies result in low overall permeabilities and very slow groundwater movement in the overburden on a regional scale. Water quality in the Wasatch Formation generally does not meet Wyoming Class I (drinking water) standards due to the dissolved mineral content. Some wells do, however, produce water of considerably better quality that does meet the Class I standard.
FORT UNION FORMATION PALEOCENE	TONGUE RIVER MEMBER A W C	The coal serves as a regional groundwater aquifer and exhibits highly variable aquifer properties. Permeability and porosity associated with the coal arise almost entirely from fractures. Coal water typically does not meet Class I or Class II (irrigation) use standards. In most cases, water from coal wells is suitable for livestock use. The coal water is used throughout the region as a source of stock water and occasionally for domestic use. W = Wyodak Coal; A = Anderson Coal; C = Canyon Coal
	LEBO MEMBER	The Lebo member, also referred to as the "Lebo Confining Layer" or "Lebo Shale". Has a mean thickness of 711 ft in the PRB and a thickness of about 400 ft in the vicinity of Gillette. The Lebo typically yields small quantities of poor quality groundwater. Where sand content is locally large, caused by channel or deltaic deposits, the Lebo may yield as much as 10 gpm.
	TULLOCK MEMBER	The Tullock member has a mean thickness of 785 ft in the PRB and a mean sand content of 53 percent which indicates that the unit generally functions well as a regional aquifer. Yields of 15 gpm are common but vary locally and may be as much as 40 gpm. Records from the SEO indicate that maximum yields of approximately 300 gpm have been achieved from this aquifer. Water quality in the Tullock Member often meets Class I standards. The extensive sandstone units in the Tullock Member are commonly developed regionally for domestic and industrial uses. The City of Gillette is currently using eight wells completed in this zone to meet part of its municipal water requirements.
LANCE FORMATION UPPER CRETACEOUS	UPPER LANCE	Silty, calcareous sandstones and interbedded sandy shales, claystones, and coals. Provides yields generally less than 20 gpm. Higher yields can occur where sand thicknesses are greatest. Water quality is typically fair to good. Also referred to as the "Upper Lance Confining Layer".
	FOX HILLS SANDSTONE	Marine sandstones and sandy shales. Has a mean thickness of 666 ft and a mean sand content over 50 percent in the PRB. Yields up to 200 gpm are common; however, yields can be significantly less. Water quality is good, with TDS concentrations commonly less than 1,000 mg/L. The City of Gillette is currently using five wells completed in this aquifer to meet municipal water requirements.
LEWIS FORMATION UPPER CRETACEOUS	PIERRE SHALE	This unit is comprised predominantly of marine shales with only occasional local thin sandstone lenses. Maximum yields are minor and overall the unit is not water bearing. Water obtained from this unit is poor with high concentrations of sodium and sulfate as the predominant ions in solution.

Compiled from Hodson et al. (1973) and Lewis and Hotchkiss (1981).

Figure 3-2. Stratigraphic Relationship and Hydrologic Characteristics of Upper Cretaceous, Lower Tertiary, and Recent Geologic Units, PRB, Wyoming

Wasatch Formation. Alluvial deposits occupy the Belle Fourche River valley and the lower portions of tributary draws where they join the river.

The Eocene Wasatch Formation forms most of the overburden in the general analysis area. The boundary between the Wasatch Formation and the underlying Paleocene Fort Union Formation is not distinct. From a practical standpoint, the top of the mineable coal zone is considered as the contact between the two formations. As indicated in Table 3-2, overburden thicknesses in the Maysdorf LBA Tract as applied for and under Alternatives 2 and 3 average about 222 feet and 239 feet respectively. As discussed in Section 3.2.1, the regional dip in this area is to the west; as a result, the overburden thickness is generally thinner to the east and increases to the west.

As shown in Figure 3-2, the Fort Union Formation is divided into three members: the Tongue River, the Lebo, and the Tullock, in descending order.

The mineable coal seams in the PRB are part of the Tongue River Member of the Fort Union. At the Cordero Rojo Mine and within the Maysdorf LBA Tract, there is one mineable coal seam. Locally, this coal zone is referred to as either the Wyodak or the Wyodak-Anderson. On the Maysdorf LBA Tract as applied for and Alternatives 2 and 3, the Wyodak coal seam averages about 62 ft in thickness (Table 3-2). Up to five noncoal splits or partings occur within the seam, but they are typically local, discontinuous lenses of carbonaceous clay or shale that are less than one ft thick.

As discussed in Chapter 2, a "no-coal" zone is present within the tract. It trends east-west throughout the central portion of Section 4, T.46N., R.71W. It is postulated that an ancient drainage channel (or paleochannel) eroded and removed the coal in this area and replaced it with unconsolidated fine sand, occasional gravel, and silty clays (CMC 2004a).

The Fort Union coal seams are subbituminous and are generally low-sulfur, low-ash coals. Typically, the coal being mined in the PRB has a higher heating value and lower sulfur content south of Gillette than north of Gillette. According to the analyses (which were done on an as-received basis) of exploration drilling samples collected in the LBA tract as proposed, the average heating value of the coal is approximately 8,445 Btu/lb, with an average of about 0.3 percent sulfur, and 1.3 percent sodium. For Alternatives 2 and 3, the average heating value of the coal is approximately 8,470 Btu/lb, with an average of about 0.3 percent sulfur, and 1.3 percent sodium, according to the coal exploration samples analyzed. [See Section 2.4 for a discussion of BLM's estimate of coal quality under BLM's preferred alternative (Alternative 3).]

3.3.1.2 Environmental Consequences

3.3.1.2.1 Proposed Action and Alternatives 2 and 3

The geology from the base of the coal seam mined to the land surface would be subject to permanent change after the coal is removed on the LBA tract under the Proposed Action or Alternatives 2 and 3. The subsurface characteristics of these lands would be radically changed by mining. The replaced overburden and interburden (backfill) would be a mixture of the geologically distinct layers of sandstone, siltstone, and shale that currently exist. As a result, there would be an alteration of the physical characteristics of the backfill.

Mining would remove an average of 222 ft of overburden and 62 ft of coal on about 2,076 acres under the Proposed Action. Mining would remove an average of 238.5 ft of overburden and 62 ft of coal on about 3,160 acres under BLM's preferred tract configuration for Alternatives 2 and 3. These acreage figures represent the estimated area of actual coal removal under the Proposed Action and Alternatives 2 and 3. Table 3-2 presents the average overburden and coal thicknesses for the Maysdorf LBA Tract as applied for and Alternatives 2 and 3.

The replaced overburden and interburden would be a relatively homogeneous (compared to the premining layered overburden and interburden) and partly recompacted mixture averaging about 264 ft in thickness under the Proposed Action and about 283 ft in thickness under Alternatives 2 and 3. Approximately 216.5 million additional tons of coal would be recovered under the Proposed Action, compared to an estimated 317.6 million tons under BLM's preferred tract configuration for Alternatives 2 and 3.

3.3.1.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal would not occur on the Maysdorf LBA Tract. Table 3-2 presents the average overburden and coal thicknesses for the existing Cordero Rojo Mine permit area, which represents the No Action Alternative. Mining operations and associated impacts would continue as permitted on the existing adjacent Cordero Rojo Mine coal leases for about nine additional years. There would be impacts to the overburden on portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine as a result of recovery of the remaining coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.3.1.3 Regulatory Compliance, Mitigation and Monitoring

Drilling and sampling programs are conducted on existing leases by all mine operators to identify overburden material that may be unsuitable for reclamation (i.e., material that is not suitable for use in reestablishing vegetation or that may affect groundwater quality due to high concentrations of certain constituents, such as selenium, or adverse pH levels). As part of the mine permitting process, each mine operator develops a management plan to ensure that this unsuitable material is not placed in areas where it may affect groundwater quality or revegetation success. Each mine operator also develops backfill monitoring plans as part of the mine permitting process to evaluate the quality of the replaced overburden. These plans are in place for the existing Cordero Rojo Mine and would be developed for the Maysdorf LBA Tract if it is leased.

3.3.1.4 Residual Impacts

Geology from the base of the coal to the surface would be subject to significant, permanent change.

3.3.2 Other Mineral Resources

3.3.2.1 Affected Environment

3.3.2.1.1 Conventional Oil and Gas

The Maysdorf LBA Tract overlies geologic structures that contain producible quantities of oil. WOGCC records indicate that 277 conventional wells have been drilled in T.46N., R.71W. and T.47N., R.71W. The Pennsylvanian-Permian Minnelusa Formation and Cretaceous Muddy Formation have produced oil and gas in the vicinity of the Maysdorf LBA Tract (WOGCC 2005a). The Minnelusa is the only formation presently producing. IHS Energy reports as of May 2005 indicate that no non-Minnelusa wells have been completed for production in the area of the LBA tract since 1981.

The wells completed in the Minnelusa Formation produce from discontinuous, marginal marine, eolian sandstone deposits. As a result, Minnelusa Formation reservoirs tend to be small and irregularly distributed. Most of the Minnelusa wells in this area were drilled in the early 1980s, and development has tended to occur on a 40-acre well spacing. There are currently four Minnelusa wells that are capable of producing in the Maysdorf LBA Tract as applied for. Cumulative production from these four wells is more than 600,000 barrels of oil.

See Section 3.11 for discussion of the ownership of the oil and gas resources in the LBA tract.

3.3.2.1.2 Coal Bed Natural Gas (CBNG)

The following discussion is based on a report on conventional oil and gas and CBNG resources in the area of the Maysdorf LBA Tract prepared by the Wyoming BLM's Reservoir Management Group (BLM WSO-RMG 2005a).

CBNG has been commercially produced in the PRB since 1989 when production began at the Rawhide Butte Field, west of the Eagle Butte Mine (De Bruin and Lyman 1999). The predominant CBNG production to date in the PRB has occurred from coal beds of the Wyodak - Anderson zone, which is the same zone that is being mined by the surface coal mines in the PRB. CBNG is being produced locally from other deeper seams in the PRB. Several wells in the vicinity of the Maysdorf LBA Tract are completed in the deeper Pawnee coal seam. These wells have produced substantial amounts of water but little to no gas, and are currently shut-in (WSO-RMG 2005a, WOGCC 2006).

Extensive development of CBNG in the Wyodak-Anderson coal has occurred in the vicinity of the Maysdorf LBA Tract. WOGCC records show that as of late May, 2005, more than 350 wells had been drilled for CBNG production in Ts.46 and 47N., R.71W. The most extensive CBNG development has occurred west of the LBA tract. Twenty-four wells have been completed and are (or have been) capable of producing from the Wyodak-Anderson coal zone in the sections that include the Maysdorf LBA Tract under the Proposed Action.

CBNG wells were initially drilled on 40-acre spacing in the Wyoming PRB. Production/reservoir analyses that have been submitted to the WOGCC in various public hearings have indicated that CBNG wells in the PRB will produce reserves from larger areas than 40 acres. As a result, the WOGCC established an 80-acre spacing pattern as the default spacing for CBNG wells completed in the PRB within the Fort Union and Wasatch Formations. Most CBNG wells on and near the Maysdorf LBA Tract were drilled on a 40-acre pattern, either because the wells were drilled before the spacing was changed to 80 acres or under the authorization of spacing exceptions granted by WOGCC. Certain townships in the PRB are exempt from the 80-acre spacing pattern rule, including Ts.46 and 47N., R.71W. (WOGCC 2005b). Although CBNG has been produced in this area for almost 10 years, there are still undrilled 40-acre spacing units in and around the Maysdorf LBA Tract and there has been little recent interest in drilling additional wells in this area. According to WSO-RMG, no new CBNG wells have been completed on or adjacent to the LBA Tract since 1998.

The ownership of oil and gas resources in the LBA tract, which includes the CBNG resources, is discussed in Section 3.11.

3.3.2.1.3 Other Minerals

Bentonite, uranium, and scoria are commercially produced in the PRB in addition to conventional oil and gas and CBNG (WSGS 2004a and 2005a).

Layers of bentonite (decomposed volcanic ash) of varying thickness are present throughout the PRB. Some of the thicker layers are mined around the edges of the PRB. Bentonite has a large capacity to absorb water, and because of this characteristic it is used in a number of processes and products, including drilling mud and cat litter. No mineable bentonite reserves have been identified on the Maysdorf LBA Tract under any of the alternatives.

There are substantial uranium resources in Campbell and Converse Counties. There are currently two operating in-situ uranium recovery sites in the PRB, which were recently combined into one operation that is located in central Converse County (WSGS 2005b). No known uranium reserves exist within the general analysis area.

Scoria, also called clinker or burn has been and continues to be a major source of aggregate for road construction in the area due to the shortage of more competent materials. Scoria consists of sediments that were baked, fused, or melted in place when the underlying coal burned spontaneously. Scoria is present within the Cordero Rojo Mine permit area, predominantly east of the coal limit. Scoria does not occur on the LBA tract as applied for under the Proposed Action or within the additional area evaluated under Alternatives 2 and 3. See Section 3.5.1.1.2 for additional information on scoria.

A search of the BLM mining claim index revealed that no active mining claims are presently located on the Maysdorf LBA Tract.

3.3.2.2 Environmental Consequences

3.3.2.2.1 Proposed Action and Alternatives 2 and 3

During mining, other minerals present on the LBA tract could not be developed. Some of these minerals could, however, be developed after mining. Before mining operations could begin, all oil and gas wells would have to be abandoned, and all oil and gas production equipment would have to be removed to a level below the coal.

The conventional oil and gas reservoirs and the CBNG reservoirs below the Wyodak-Anderson coal, including the Pawnee coal, would not be directly disturbed by removal of the Wyodak-Anderson coal. The oil and gas lessee could re-complete old wells or drill new wells to recover oil and gas resources from any subcoal oil and gas reservoirs following mining and reclamation. This would only occur if they believe that the value of the reserves would justify the expense of recompleting or drilling wells.

The BLM WSO-RMG reviewed the existing conventional oil and gas production data in the general analysis area (WSO-RMG 2005a). Sufficient production data are available from Minnelusa wells in the vicinity of the tract to prepare reserve estimates using decline analyses. As discussed above, WOGCC records show that there are currently four Minnelusa wells located on the LBA tract as applied for that are capable of producing. These wells include two producers, one shut-in well and one injector well. According the WSO-RMG's evaluation, these wells appear to have exhausted most of their recoverable reserves and there has been little interest in exploration and development of Minnelusa reservoirs in this area in recent years.

CBNG resources that have not been recovered from the Wyodak-Anderson zone prior to mining would be lost when the coal is removed. Coal seam dewatering in advance of, and as a result of, open pit mining also reduces the hydrostatic pressure, which may allow CBNG to desorb and escape from the coal bed.

For the purposes of this EIS, the BLM WSO-RMG reviewed the existing CBNG resource and production data in the general analysis area (WSO-RMG 2005a). CBNG development was initiated in this area in the mid- to late-1990s, which is relatively early in the PRB CBNG play. As a result, there is generally sufficient production data available to estimate well life and reserves for existing CBNG wells on the Maysdorf LBA Tract.

WSO-RMG prepared decline analyses, using IHS Energy's "Powertools" software, for all the CBNG wells in Ts.46 and 47N., R.71W. Decline analyses prepared for 24 wells located in the sections containing the LBA tract are considered to be most representative of the tract itself. Combined, these 24 wells have an approximate average cumulative production of 80,000 mcf and an average estimated ultimate recovery of 86,000 mcf. Typical economic life for these wells might range from 3.7 to 7.3 years.

WSO-RMG analyzed production in two sections in the vicinity of the Maysdorf LBA Tract (Section 6 and 7, T.47N., R.71W.) which have had wells drilled and produced on most of the 16 possible 40-acres spacing units. This analysis indicated that cumulative production and estimated ultimate recoveries for the 24 wells drilled in these two sections are roughly half what would be projected by a combined 24-well analysis assuming uniform 40-acre reservoir drainage. This supports the concept that the wells in the area of the Maysdorf LBA Tract are draining more than 40 acres and helps explain the recent lack of applications to drill the remaining undrilled 40-acre parcels in and adjacent to the tract.

In 2000, the WSO-RMG and USGS collected data, including coal gas content, from the Wyodak-Anderson zone in a coal core hole located within the Caballo Mine area (Section 16, T.48N., R.71W.) about five miles north of the Maysdorf LBA Tract. Based on the core desorption analysis, the average gas content of the coal cores when they were taken was approximately 8.3 scf/ton (USGS 2005). The coal cores that were collected at the Caballo Mine site had a slightly higher apparent rank than the coal in the Maysdorf LBA Tract area. As a result, the coal cores would be expected to have slightly higher gas content than the coal within the LBA tract. In their lease application, CMC estimated that the Maysdorf LBA Tract includes approximately 234.8 million tons of in-place coal resources, as applied for. Assuming a gas content of 8.3 scf/ton in 2000, WSO-RMG estimated that 234.8 million tons of coal would have contained approximately 1,948,840 mcf of CBNG. Total cumulative production from the 24 wells in the sections containing the LBA tract has actually been 1,919,793 mcf of CBNG, with a total estimated ultimate CBNG recovery of 2,061,319 mcf. The EUR is greater than the gas-in-place estimated for the tract, but the estimate is within the range of uncertainty resulting from production and reservoir depletion that occurred in this area before the coal cores that were collected desorbed.

These analyses suggest that most of economically recoverable CBNG resources in the vicinity of the LBA tract have been recovered from the Wyodak-Anderson zone and that there are insufficient remaining reserves to support additional drilling. This conclusion is further supported by the lack of new drilling activity on the LBA tract since 1998. Therefore, mining the Maysdorf LBA Tract is unlikely to affect, or be affected by, production of CBNG from the Wyodak-Anderson zone.

Section 3.11.1 includes a discussion on the ownership of the oil and gas resources on the LBA tract and the oil and gas facilities in the area of the tract.

3.3.2.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal would not occur on the Maysdorf LBA Tract. Mining operations would continue to limit the development of other mineral resources described above and in Table 2-3 on the existing adjacent Cordero Rojo Mine coal leases and on portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine, which would be disturbed to recover the coal in the existing leases. Mineral development limitations related to mining operations at the Cordero Rojo Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.3.2.3 Regulatory Compliance, Mitigation and Monitoring

The reservoir analyses conducted by the BLM WSO-RMG indicate that most of the recoverable conventional oil and gas and CBNG resources on the Maysdorf LBA Tract have probably been produced by the existing wells. Potential does exist for conflicts between coal operations and CBNG wells completed in coal zones below the Wyodak-Anderson seam.

If the federal coal in the tract is leased and conflicts do develop between the operators of the oil and gas wells and the surface coal mine operator, there are several mechanisms that can be used to facilitate recovery of the conventional oil and gas and CBNG resources prior to mining. These include:

- BLM will attach a Multiple Mineral Development stipulation to the Federal coal lease, which states that BLM has the authority to withhold approval of coal mining operations that would interfere with the development of mineral leases issued prior to the coal lease (see Appendix D).
- Conventional oil and gas wells must be abandoned while

mining and reclamation operations are in progress but could be recompleted or redrilled following mining if the value of the remaining reserves would justify the expense of reestablishing production.

- BLM has a policy in place on CBNG-coal conflicts (BLM Instruction Memorandum No. 2006-153), which directs BLM decision-makers to optimize the recovery of both resources and ensure that the public receives a reasonable return (BLM 2006a). This memorandum offers royalty incentives to CBNG operators to accelerate production in order to recover the natural gas while simultaneously allowing uninterrupted coal mining operations. In addition, this memorandum also states that it is the policy of the BLM to encourage oil and gas and coal companies to resolve conflicts between themselves; when requested, the BLM will assist in facilitating agreements between the companies.
- Mining of the Maysdorf LBA Tract cannot occur until the coal lessee has a permit to mine the tract approved by the WDEQ/LQD and a MLA mining plan approved by the Secretary of the Interior. Before the MLA mining plan can be approved, BLM must approve the R2P2 for mining the tract. Prior to approving the R2P2, BLM can review the status of CBNG and conventional oil and gas development on the tract and the mining sequence proposed by the coal lessee. The permit approval process generally takes the coal lessee several years, during which time CBNG resources can be recovered.
- Prior to mining the Federal coal, the coal lessee can negotiate an agreement with owners and operators of existing oil and gas facilities on the tract, including owners and operators of oil and gas well and pipeline facilities, regarding removal and relocation of those facilities prior to mining.

3.3.2.4 Residual Impacts

CBNG resources not recovered prior to mining would be vented to the atmosphere and permanently lost.

3.3.3 Paleontology

3.3.3.1 Affected Environment

The formation exposed on the surface of the Maysdorf LBA Tract is the sedimentary Eocene Wasatch Formation, which is known to produce fossil vertebrates of scientific significance throughout Wyoming, including the PRB (Delson 1971, Winterfeld 1978, EVG 2001).

BLM ranks areas according to their potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. The Wasatch Formation is ranked as fulfilling BLM Paleontology Condition No. 1, which is described in the

Paleontological Resource Management Handbook 8270-I as "areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils." According to the handbook, "consideration of paleontological resources will be necessary if the Field Office review of available information indicates that such fossils are present in the area".

The BLM in Wyoming uses an additional planning tool, called the PFYC, to classify geological units, usually at the formation or member level, according to the probability that they will yield paleontological resources that are of concern to land managers. This classification system is based largely on how likely a geologic unit is to produce scientifically significant fossils. BLM considers the Wasatch Formation to fulfill either the PFYC Class 4 or Class 5, depending on the nature of bedrock exposures present. PFYC classes 4 and 5 are described as follows:

> Class 4 - These geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.
>
> Class 5 - Fossilferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant non-vertebrate (plant and invertebrate) fossils, and that are at risk of natural degradation and/or human-caused adverse impacts.

Although the Wasatch Formation is known to produce fossil vertebrates of scientific significance in Wyoming, outcrops of the Wasatch Formation in the PRB are not generally well-exposed and the conditions of deposition of the formation have contributed to a low preservation potential for fossils. Vertebrate fossils that have been described from the Wasatch Formation include mammals such as early horses, tapiroids, condylarths, primates, insectivores, marsupials, creodonts, carnivores, and multituberculates; reptiles such as crocodilians, alligators, lizards, and turtles; birds; eggs; amphibians; and fish. Non-marine invertebrates such as mollusks and ostrocods have also been described from the Wasatch.

Fossil plant material is common in the Wasatch Formation. The fossil plants inventoried are primarily leaves and fossilized wood. The leaves usually occur as lignitic impressions in sandstone and siltstone and as compact masses in shale. Leaves are the most abundant fossils found during paleontological surveys and are frequently encountered during mining operations. Fossilized wood often occurs near the top of a coal seam, in carbonaceous shale or within channel sandstone. Exposures of fossil logs are common, but usually very fragmentary. Like fossil leaves, fossil logs can be readily collected in the PRB.

A paleontological resource evaluation of the Maysdorf general analysis area was conducted in June 2005 by EVG. The evaluation included a pre-field geology and paleontology review and a pedestrian field examination for fossils along rock outcrops. A primary goal of the evaluation was to locate unique localities of fossilized vertebrate skeletal material and evidence (trace fossils) such as those reported to occur in the Wasatch Formation within the PRB. Seven fossil localities were identified as a result of the records search, none of which were unique finds or occur within the LBA tract under the Proposed Action or within the area added under Alternatives 2 and 3. Five fossil localities (two plant, one invertebrate, and two vertebrate) were identified during the field survey. These localities occur in exposures of the Wasatch Formation south of the Belle Fourche River in Sections 9, 10, and 14, T.46N., R.71W. None of the fossil material found at these localities is considered to have much scientific significance and as a result no specimens were collected. Vertebrate fossils appear to be very scarce. Fossil wood is much more common and observed at many unrecorded locations, particularly associated with coal.

No significant or unique paleontological resource localities have been recorded on federal lands in the general analysis area and no specific mitigation has been recommended for paleontology.

3.3.3.2 Environmental Consequences

3.3.3.2.1 Proposed Action and Alternatives 2 and 3

The rock outcrops present on the Maysdorf LBA Tract were examined for the presence of fossils, as discussed above, and no scientifically significant fossils were located. Fossils with scientific significance could be present on the tract but not exposed at the surface. If the tract is leased under the Proposed Action or Alternatives 2 and 3, paleontological resources located on the tract that are not exposed on the surface would be destroyed when the overburden is removed.

3.3.3.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal would not occur on the Maysdorf LBA Tract. Mining operations and the associated potential impacts to paleontological resources described above would continue as permitted on the existing adjacent Cordero Rojo Mine coal leases and on portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine, which would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.3.3.3 Regulatory Compliance, Mitigation and Monitoring

If the Maysdorf LBA Tract is leased, BLM will attach a stipulation to the lease requiring the operator to report significant paleontological finds to the authorized federal agency and suspend production in the vicinity of the find until an approved paleontologist can evaluate the paleontological resource (Appendix D).

3.3.3.4 Residual Impacts

Paleontological resources that are not identified and removed prior to or during mining operations would be lost.

3.4 Air Quality

3.4.1 Background

The air quality of any region is controlled primarily by the magnitude and distribution of pollutant emissions and the regional climate. The transport of pollutants from specific source areas is strongly affected by local topography. In the mountainous western United States, topography is particularly important in channeling pollutants along valleys, creating upslope and downslope circulations that may entrain airborne pollutants, and blocking the flow of pollutants toward certain areas. In general, local effects are superimposed on the general weather regime and are most important when the large-scale wind flow is weak.

Wyoming can be characterized as having a combination of both highland and mid-latitude semiarid climates. The dominant factors that affect the climate of the area are elevation, local relief, and the mountain barrier effect. This barrier effect can produce marked temperature and precipitation differences between windward and leeward slopes. Generally, temperature decreases and precipitation increases with increasing elevation. See Section 3.1.1 for additional information about the climate in the general analysis area.

The general analysis area, shown in Figure 3-1, is located in the east-central portion of the PRB, a part of the Northern Great Plains that includes most of northeastern Wyoming. As discussed in Section 3.2.1, the topography is primarily rolling plains and tablelands of moderate relief (with occasional valleys and buttes). Elevations range from about 4,510 ft to 4,770 ft above sea level. The Big Horn Mountains lie approximately 60 miles to the west and the Black Hills lie approximately 60 miles to the east.

3.4.1.1 Regulatory Framework

Regulations applicable to surface coal mining may include NAAQS/WAAQS, PSD, NSPS, and the Federal Operating Permit Program (Title V). These regulatory programs are described below.

Air pollution impacts are limited by local, state, tribal, and federal air quality regulations and standards, and implementation plans established under the federal CAA and the CAAA of 1990. In Wyoming, air pollution impacts are managed by WDEQ/AQD under the WAQSR and the EPA approved State Implementation Plan. A fundamental requirement of both federal and state regulations is that ambient concentrations for specific pollutants do not exceed allowable levels, referred to as the Ambient Air

Quality Standards (or AAQS). The EPA and the State of Wyoming have established these standards at levels deemed necessary to preclude adverse impacts on human health and welfare. The National AAQS (or NAAQS) set nationwide thresholds for maximum acceptable concentrations of various pollutants. Currently the EPA has established NAAQS for six pollutants, which are also known as "criteria pollutants". The State of Wyoming has also established ambient air quality standards (or WAAQS) for those pollutants that are as stringent as or more stringent than the NAAQS, and are enforceable under WAQSR. Selected NAAQS and WAAQS are shown in Table 3-3. The NAAQS and WAAQS are health-based criteria for the maximum acceptable concentrations of criteria pollutants at all locations to which the public has access.

Pursuant to the CAA, the EPA has developed classifications for distinct geographic regions known as air basins and for major MSAs. Under these classifications, for each federal criteria pollutant, each air basin (or portion of a basin or MSA) is classified as in "attainment" if the area has "attained" compliance with (that is, not exceeded) the adopted NAAQS for that pollutant or is classified as "non-attainment" if the levels of ambient air pollution exceed the NAAQS for that pollutant. Areas for which sufficient ambient monitoring data are not available are designated as "unclassified" for those particular pollutants. States designate areas within their borders as being in "attainment" or "non-attainment" with the AAQS. Existing air quality throughout most of the PRB in Wyoming is in attainment with all ambient air quality standards, as demonstrated by comparing the background concentration levels with the AAQS concentration levels presented in Table 3-3. However, the Sheridan, Wyoming area has been designated as a non-attainment area (PM_{10} – moderate) where the applicable standards have been violated in the past.

A company initiating a project must go through the WDEQ/AQD New Source Review permitting process to obtain either a construction or modification permit or a permit waiver. During the New Source Review permitting process, applicants must demonstrate compliance with the AAQS standards; this can be done by modeling or other methods approved by the WDEQ/AQD Administrator. A project will typically model for criteria pollutants that would be emitted by the project in order to show the project's contribution to ambient air quality concentrations. The assumed background pollutant concentrations included in Table 3-3 were provided by WDEQ/AQD (BLM 2005a). The assumed background pollutant concentrations are below applicable NAAQS and WAAQS for all criteria pollutants and averaging times.

The PSD regulation is intended to prevent deterioration of air quality in areas that are in attainment with the NAAQS. The CAA requires EPA to place each airshed within the U.S. into one of three PSD area classifications. PSD Class I is the

Table 3-3. Assumed Background Air Pollutant Concentrations, Applicable AAQS, and PSD Increment Values (in µg/m³).

Criteria Pollutant	Averaging Time[1]	Background Concentration	Primary NAAQS[2]	Secondary NAAQS[2]	WAAQS	PSD Class I Increments	PSD Class II Increments
Carbon monoxide	1-hour	3,336[3]	40,000	40,000	40,000	---	---
	8-hour	1,381	10,000	10,000	10,000	---	---
Nitrogen dioxide	Annual	5[4]	100	100	100	2.5	25
Ozone	8-hour	140[5]	157	157	157	---	---
Sulfur dioxide	3-hour	181[6]	---	1,300	1,300	25	512
	24-hour	62[6]	365	---	260	5	91
	Annual	13[6]	80	---	60	2	20
PM_{10}[7]	24-hour	54[8]	150	150	150	8	30
	Annual	13[8]	--	--	50	4	17
$PM_{2.5}$[7]	24-hour	19[9]	35	35	65	---	---
	Annual	7.6[9]	15	15	15	---	---

[1] Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.
[2] Primary standards are designed to protect public health; secondary standards are designed to protect public welfare.
[3] Data collected by Amoco at Ryckman Creek for an eight-month period during 1978-1979, summarized in Riley Ridge EIS (BLM 1983).
[4] Data collected at TBNG, Campbell County, Wyoming in 2002 (Source: WDEQ).
[5] Data collected at TBNG, Campbell County, Wyoming in 2001-2003 (8-hour); 2002 (1-hour). (Source: WDEQ).
[6] Data collected by Black Hills Power & Light at Wygen 2, Campbell County, Wyoming, in 2002.
[7] On October 17, 2006, EPA published final revisions to the NAAQS for particulate matter which took effect on December 18, 2006. The revision strengthens the 24-hour $PM_{2.5}$ standard from 65 to 35 µg/m³ and revokes the annual PM_{10} standard of 50 µg/m³. The State of Wyoming will enter into rulemaking to revise the WAAQS.
[8] Data collected by AMAX coal at the Eagle Butte Mine, Campbell County, Wyoming, in 2002.
[9] Data collected in Gillette, Wyoming in 1999.

Source: (BLM 2005a).

most restrictive air quality category. Mandatory federal Class I areas were designated by Congress and include international parks, national wilderness areas greater than 5,000 acres in size, national memorial parks greater than 5,000 acres in size, and national parks greater than 6,000 acres in size which were in existence on August 7, 1977 [40 CFR 52.21(e)]. These classifications may not be redesignated. All areas not established as Class I were designated as Class II areas, which allow a relatively greater deterioration of air quality over that in existence in 1977, although still within the NAAQS. No Class III areas, which would allow air quality to degrade to the NAAQS, have been designated. The federal land managers have also identified certain federal assets with Class II status as "sensitive" Class II areas for which air quality and/or visibility are valued resources. The federal CAA also provides for specific visibility protection of mandatory federal Class I areas.

Table 3-4 is a list of mandatory federal Class I areas, tribal Class I areas, and federal Class II areas that are of special interest in the region and their distance from the Maysdorf tract general analysis area. Wind Cave National Park, Badlands Wilderness Area, and the Northern Cheyenne Indian Reservation are the closest Class I areas to the Maysdorf LBA Tract. Most of the PRB in Wyoming is designated as PSD Class II with less stringent requirements. Even though the development activities being considered in this EIS would occur within areas designated as PSD Class II, the potential impacts are not allowed to cause incremental effects greater than the more stringent Class I thresholds to occur inside any distant PSD Class I area.

The PSD regulation prevents deterioration of air quality in attainment areas by establishing increments, or maximum allowable increases in the ambient concentration of PM_{10}, NO_2, and SO_2 for Class I and Class II areas. As shown in Table 3-3, the allowable incremental impacts for NO_2, PM_{10}, and SO_2 within PSD Class I areas are very limited.

Future development projects that have the potential to emit more than 250 tpy of any criteria pollutant (or certain listed sources that have the potential to emit more than 100 tpy) would be required to undergo a regulatory PSD increment consumption analysis under the federal New Source Review permitting regulations. Development projects subject to the PSD regulations must also demonstrate the use of BACT and show that the combined impacts of all PSD sources will not exceed the allowable incremental air quality impacts for NO_2, PM_{10}, or SO_2. Modifications to existing major PSD sources are also subject to PSD regulation if the modification results in a significant net emissions increase of any regulated pollutant. The net emissions increase is determined by adding the modification to the permits issued after a baseline date. In the PRB, the PM_{10} baseline year is 1997; the NO_2 baseline year is 1988.

To date, there are no coal mines within the State of Wyoming that

Table 3-4. Approximate Distances and Directions from the Maysdorf Tract General Analysis Area to PSD Class I and Class II Sensitive Receptor Areas.

Receptor Area	Distance (miles)	Direction to Receptor
Mandatory Federal PSD Class I Area		
Badlands Wilderness Area[1]	130	ESE
Bridger Wilderness Area	215	SW
Fitzpatrick Wilderness Area	210	WSW
Gates of the Mountain Wilderness Area	380	WNW
Grand Teton National Park	245	W
North Absaroka Wilderness Area	205	WNW
Red Rocks Lake Wilderness Area	325	WNW
Scapegoat Wilderness Area	420	NW
Teton Wilderness Area	220	W
Theodore Roosevelt National Park (North Unit)	270	NNE
Theodore Roosevelt National Park (South Unit)	225	NNE
U.L. Bend Wilderness Area	270	NNW
Washakie Wilderness Area	185	W
Wind Cave National Park	100	ESE
Yellowstone National Park	220	W
Tribal Federal PSD Class I		
Fort Peck Indian Reservation	290	N
Northern Cheyenne Indian Reservation	110	NNW
Federal PSD Class II		
Absaroka-Beartooth Wilderness Area	205	WNW
Agate Fossil Beds National Monument	135	ESE
Badlands National Park	130	ESE
Bighorn Canyon National Recreation Area	145	NW
Black Elk Wilderness Area	85	E
Cloud Peak Wilderness Area	80	WNW
Crow Indian Reservation	100	NW
Devils Towner National Monument	50	NE
Fort Belknap Indian Reservation	310	NNW
Fort Laramie National Historic Site	130	SSE
Jewel Cave National Monument	70	ESE
Mount Rushmore National Memorial	90	E
Popo Agie Wilderness Area	205	SW
Soldier Creek Wilderness Area	120	SE

[1] The U.S. Congress designated the Wilderness Area portion of Badlands National Park as a mandatory Federal PSD Class I area. The remainder of Badlands National Park is a PSD Class II area.

have been subject to PSD review in the permitting process. Existing surface coal mining operations in the PRB, including the Cordero Rojo Mine, are not subject to PSD regulations for two reasons: 1) surface coal mines are not on the EPA list of 28 major emitting facilities for PSD regulation; and 2) point-source emissions from individual mines have not exceeded the PSD emissions threshold. A new mine would be classified as a major source and subject to PSD review if potential emissions of any regulated pollutant would equal or exceed 250 tpy. Fugitive emissions are not included in the definition of potential emissions except for certain specified source types [40 CFR 52.21, (b)(1)(iii)]. Mining-related fugitive emissions are exempt from the applicability determination. This NEPA analysis compares potential air quality impacts from the Proposed Action and Alternatives 2 and 3 to applicable ambient air quality standards, PSD increments, and AQRVs (such as visibility), but it does not constitute a regulatory PSD analysis; rather, it is strictly for informational purposes.

All sources being permitted within the State of Wyoming must utilize BACT, not just sources subject to PSD review. During the New Source Review permitting process, a BACT analysis is performed for the proposed construction or modification. The BACT process evaluates possible control technologies for the proposed action on the basis of technical feasibility and economic reasonability. Decisions about which technology should be applied are made on a case-by-case basis and are mandated through the permit. See Section 3.4.2.3 for a discussion of BACT measures that have been applied at coal mines.

The NSPS were established by the CAA and adopted by reference into the WAQSR. The standards, which are for new or modified stationary sources, require the sources to achieve best-demonstrated emission control technology. The NSPS apply to specific processes that are listed in the standards. For surface coal mining in the PRB, this includes certain activities at coal preparation plants. The requirements applicable to these existing units can be found in 40 CFR Part 60, Subpart Y (Standards of Performance for Coal Preparation Facilities).

Major sources of air pollutants must obtain an operating permit from WDEQ/AQD Operating Permit Program (also known as Title V). A "major source" is, generally, a facility that emits over 100 tpy of any criteria pollutant, 25 tpy of combined HAPs or 10 tpy of an individual HAP. The operating permit compiles all applicable air quality requirements for a facility and specifies compliance assurance in the form of testing, monitoring, reporting, and recordkeeping requirements.

3.4.1.1.1 Surface Coal Mine Regulatory Framework

The WDEQ/AQD administers a permitting program to assist the agency in managing the state's air resources. Under this program, anyone planning to construct, modify, or use a facility capable of emitting designated pollutants into the atmosphere must obtain an air quality permit to construct. Coal mines fall into this category. A new coal mine or a modification to an existing mine must be permitted by WDEQ/AQD under WAQSR Chapter 6, Section 2 and must demonstrate that mining operations will comply with all applicable aspects of WAQSR. The following summarizes the construction/modification permitting analysis for surface coal mines.

When a company decides to construct a new surface coal mine or proposes a modification to an existing surface coal mine that will cause an increase in pollutant emissions, they must submit an application, which is reviewed by the WDEQ/AQD New Source Review staff and the applicable WDEQ/AQD Field Office. Typically, a company will meet with the WDEQ/AQD prior to submitting an application to determine issues and details that need to be included in the application. A surface coal mining application will include the standard application, BACT measures that will be implemented, an inventory of point and fugitive sources in the area, and modeling analyses.

BACT must be utilized for all sources being permitted within the State of Wyoming. WAQSR Chapter 6, Section 2(b)(v) lists BACT measures to be utilized by (but not limited to) large mining operations. Applicants use these and other BACT measures in the development of their own PM_{10} and NO_2 point and fugitive source inventories (see Section 3.4.2.3 for a discussion of mining BACT measures). During the application review, WDEQ/AQD can also require further control measures through the BACT review process.

For a coal mine PM_{10} modeling analysis, an applicant must put together an emission inventory of PM_{10} from their facility and surrounding sources. For PM_{10}, both point sources and fugitive dust emissions are quantified. The emissions are based on the facility's potential to emit in the highest production year. The applicant also examines the facilities at surrounding coal mines and their previous air quality permits to determine the worst-case emission year for those facilities, based on potential to emit. They then choose two or more years for modeling analyses.

Long-term PM_{10} modeling is conducted for the permit application to demonstrate compliance with the annual PM_{10} standard. Per WDEQ/AQD guidance, the Industrial Source Complex Long-Term Model, Version 3 (ISCLT3) is used for point sources. For fugitive emission sources, the FDM is used. A PM_{10} background concentration of 15 $\mu g/m^3$ and a NO_x background concentration of 20 $\mu g/m^3$ are used, which WDEQ/AQD has chosen as representative of background ambient air quality in the area prior to operation of coal mine sources. Potential emissions corresponding to the maximum production level from the coal mine undergoing permitting and other coal mines in the area are added to this background. The resulting particulate levels are then compared to the average annual PM_{10} standard of 50 μg/m^3 and the average annual NO_x standard of 100 μg/m^3 to determine compliance with the annual WAAQS. This constitutes a demonstration of compliance with the "long-term" or annual WAAQS.

The background concentrations for PM_{10} and NO_x concentrations chosen by WDEQ/AQD are different than the background PM_{10} and NO_x concentrations shown in Table 3-3. The background values chosen by WDEQ/AQD are representative of background ambient air quality prior to coal mining. The values shown in the table are based on recently monitored values in the PRB and include all sources operating at the time the value was measured, including existing coal mine operations located around Gillette. The annual background values shown in Table 3-3 for PM_{10} and NO_x are based on data collected for a recent evaluation of potential cumulative air quality impacts in the PRB conducted by ENSR for the Wyoming and Montana (BLM 2006b), which is discussed in Chapter 4.

Short-term PM_{10} modeling is not required by WDEQ/AQD, nor does WDEQ/AQD consider it to be an accurate representation of short-term impacts. The CAAA (Section 234) mandates the Administrator of the EPA to analyze the accuracy of short-term modeling in regard to fugitive particulate emissions from surface coal mines. A June 26, 1996 letter from EPA Region VIII to Wyoming State Representatives states the results of a study where the short-term model failed to meet evaluation criteria and tended to over-predict 24-hr impacts of surface coal mines. The Memorandum of Agreement of January 24, 1994 between EPA Region VIII and the State of Wyoming allows WDEQ/AQD to conduct monitoring in lieu of short-term modeling for assessing coal mining-related impacts in the PRB. This regulatory procedure remains in place and in effect. Ambient particulate monitoring is required of each coal mine through conditions of their respective permits.

Coal mines in the PRB are also required to quantify NO_2 emissions from their facilities. Dispersion modeling is required to demonstrate compliance with the ambient standard. Potential emissions from diesel powered mining equipment and blasting are modeled. Train locomotive engine emissions are also quantified and included in the NO_2 modeling analysis.

The application is reviewed by WDEQ/AQD to determine compliance with all applicable air quality standards and regulations. This includes review of compliance with emission limitations established by NSPS, review of compliance with ambient standards through modeling analyses, and establishment of control measures to meet BACT requirements. The WDEQ/AQD-proposed permit conditions are placed on public notice for a 30-day review period, after which a final decision on the permit is made.

3.4.1.2 Emission Sources

Air quality conditions in rural areas in the PRB are likely to be very good, as they are characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations. Occasional high concentrations of CO and particulate matter may occur in more urbanized areas (e.g., cities of Gillette, Sheridan, and Buffalo) and around industrial facilities, especially under stable atmospheric conditions that occur during winter.

The major types of emissions that come from surface coal mining activities are in the form of fugitive dust and tailpipe emissions from large mining equipment. Activities such as blasting, excavating, loading and hauling of overburden and coal, and the large areas of disturbed land all produce fugitive dust. Stationary or point sources are associated with coal crushing, storage, and handling facilities. In general, particulate matter (PM_{10}) is the major significant pollutant from coal mine point sources.

Blasting is responsible for another type of emission from surface coal mining. Overburden blasting sometimes produces gaseous, orange-colored clouds that contain NO_2. Exposure to NO_2 may have adverse health effects, as discussed in Section 3.4.3. NO_2 is one of several products resulting from the incomplete combustion of explosives used in the blasting process. Wyoming's ambient air standards for NO_2 are shown in Table 3-3.

Other existing air pollutant emission sources within the region include:

- exhaust emissions (primarily CO and NO_x) from existing natural gas fired compressor engines used in production of natural gas and CBNG; gasoline and diesel vehicle tailpipe emissions of combustion pollutants (VOCs, CO, NO_x, PM_{10}, $PM_{2.5}$, and SO_2);
- dust (particulate matter) generated by vehicle travel on unpaved graded roads, windblown dust from neighboring areas, agricultural activities such as plowing, and paved road sanding during the winter months;
- transport of air pollutants from emission sources located outside the region;
- emissions from railroad locomotives used to haul coal (primarily NO_2 and PM_{10}); and
- SO_2 and NO_x from power plants. The closest coal-fired power plants are the Dave Johnston plant, located about 80 miles south-southwest of the Maysdorf LBA Tract, and the Wyodak, Wygen, and Neil Simpson plants, located about 15 miles north of the Maysdorf LBA Tract.

3.4.2 Particulate Emissions

3.4.2.1 Affected Environment for Particulate Emissions

Until 1989, the federally regulated particulate matter pollutant was measured as TSP. This measurement included all suspendable dust (generally less than 100 microns in diameter). In 1989, the federally regulated particulate matter pollutant was changed from a TSP-based standard to a PM_{10}-based standard. PM_{10} is particulate matter with an aerodynamic diameter of 10 microns or less that can potentially penetrate into the lungs and cause health problems. Wyoming added PM_{10} based standards to match the federal standards in 1989 and retained the TSP standards as state standards until March 2000. Wyoming's ambient air standards for PM_{10} are shown in Table 3-3. On September 21, 2006, EPA announced final revisions to the NAAQS for particulate matter, which were published in the *Federal Register* on October 17, 2006 and took effect December 18, 2006. The revision strengthens the 24-hour $PM_{2.5}$ standard from 65 to 35 $\mu g/m^3$ and revokes the annual PM_{10} standard of 50 $\mu g/m^3$. EPA retained the existing annual $PM_{2.5}$ standard of 15 $\mu g/m^3$ and the 24-hour PM_{10} standard of 150 $\mu g/m^3$. The State of Wyoming will enter into rulemaking to revise the Wyoming Ambient Air Quality Standards. Wyoming adopted 24-hour and annual $PM_{2.5}$ standards in March 2000, which are shown in Table 3-3.

3.4.2.1.1 Regional Particulate Emissions

As a result of WDEQ/AQD requirements for the PRB mines to collect air quality data, which is discussed in Section 3.4.2.3, the eastern PRB one of the most intensely monitored areas in the world. There are numerous monitors located at and adjacent to mining operations in the PRB (Figure 3-3). These include six TSP monitors, four $PM_{2.5}$ monitors and 30 PM_{10} monitors. Data for TSP date back to 1980 and data for PM_{10} date back to 1989. Through 2004, nearly 57,000 TSP and 27,000 PM_{10} samples had been collected. Table 3-5 uses the annual arithmetic average of all sites to summarize these data from 1980 through 2004.

As indicated in Table 3-5, the long-term trend in particulate emissions remained relatively flat through 1998. The overall average annual TSP concentration from 1980 through 1998 was 33.1 $\mu g/m^3$, with annual averages ranging between 27.8 $\mu g/m^3$ and 39.4 $\mu g/m^3$. There were increases in 1988 and 1996, which may have been the result of fires in the region during those years. Annual average PM_{10} concentrations from 1989 through 1998 were similarly relatively flat, ranging between 12.9 $\mu g/m^3$ and 16.5 $\mu g/m^3$, with an overall average of 15.4 $\mu g/m^3$.

This time period (1980-1998) was associated with significant growth in the surface coal mining industry. Coal production increased from about 59 mmtpy to over 293 mmtpy (an increase of almost 500 percent), and

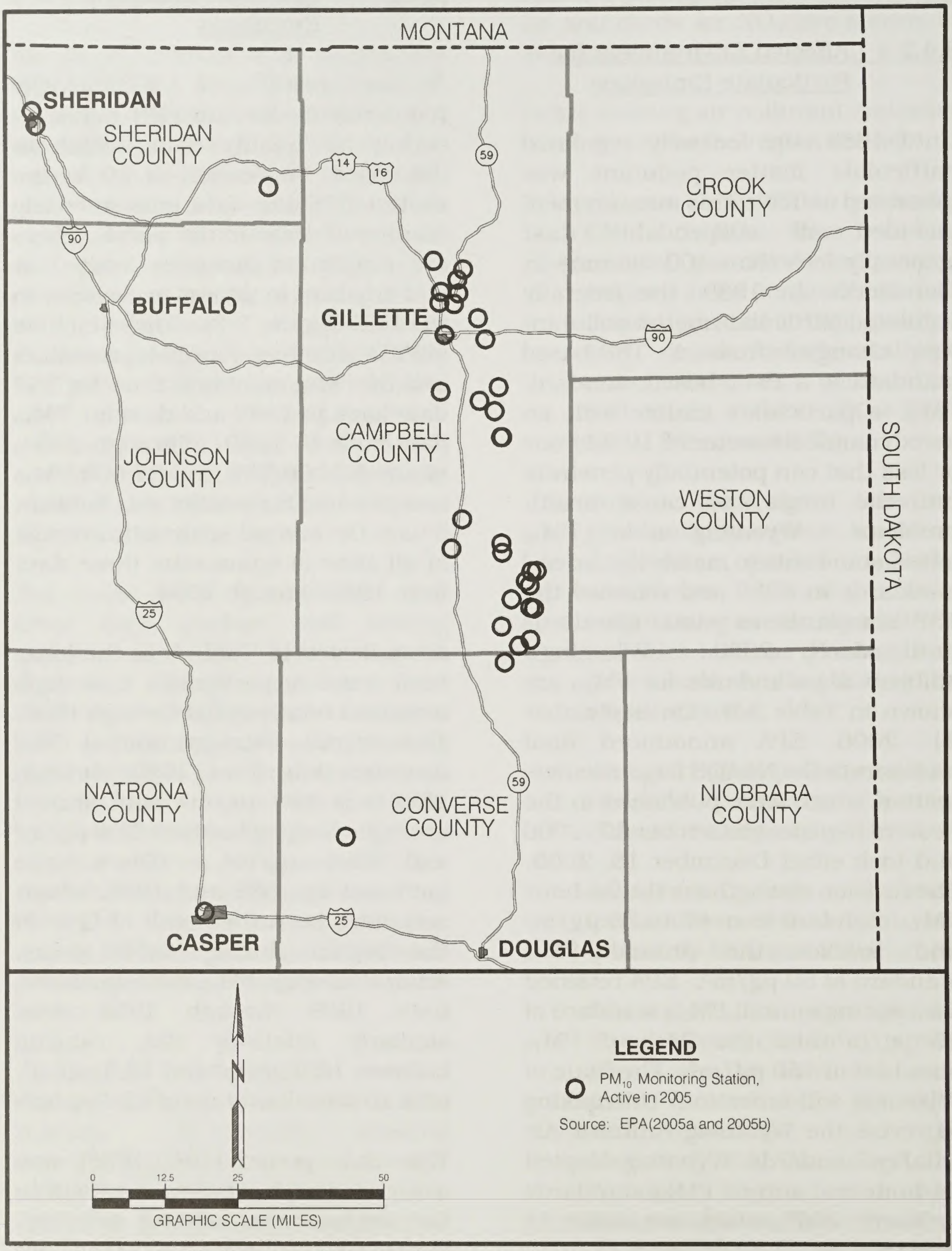

MONTANA
SHERIDAN
SHERIDAN COUNTY
14
16
59
90
CROOK COUNTY
BUFFALO
GILLETTE
90
CAMPBELL COUNTY
JOHNSON COUNTY
WESTON COUNTY
SOUTH DAKOTA
25
NATRONA COUNTY
59
CONVERSE COUNTY
NIOBRARA COUNTY
25
CASPER
DOUGLAS
N
0
12.5
25
50
GRAPHIC SCALE (MILES)
LEGEND
PM_{10} Monitoring Station, Active in 2005
Source: EPA(2005a and 2005b)

Figure 3-3. Active PM_{10} Monitoring Stations in Northeastern Wyoming.

Table 3-5. Summary of WDEQ/AQD Reports on Air Quality Monitoring in Wyoming's PRB, 1980-2004.

Year	Coal Produced (mmtpy)	Overburden Moved (mmbcy)	Number of Mines Operating/ Monitoring TSP/ Monitoring PM$_{10}$[1]	Number of TSP/PM$_{10}$ Monitoring Sites[2]	TSP Average (μg/m^3)	PM$_{10}$ Average (μg/m^3)
1980	58.7	105.3	10/14/0	34/0	35.5	na[3]
1981	71.0	133.4	11/13/0	35/0	39.4	na
1982	76.1	141.1	11/14/0	40/0	31.2	na
1983	84.9	150.9	13/14/1	41/1	32.6	11.2
1984	105.3	169.5	14/16/1	42/1	33.9	11.1
1985	113.0	203.4	16/17/0	49/0	32.3	na
1986	111.2	165.7	16/17/0	45/0	29.3	na
1987	120.7	174.6	16/17/0	43/0	31.7	na
1988	138.8	209.7	16/17/0	43/0	37.7	na
1989	147.5	215.6	15/17/3	40/3	32.1	15.9
1990	160.7	220.1	17/17/5	47/5	34.3	14.8
1991	171.4	242.3	17/17/5	46/6	32.7	16.5
1992	166.1	296.0	17/17/7	41/7	31.7	15.9
1993	188.8	389.5	17/17/8	40/11	27.8	14.5
1994	213.6	483.9	17/18/8	44/11	31.7	15.5
1995	242.6	512.7	16/18/8	41/12	29.6	12.9
1996	257.0	605.4	17/18/8	41/12	35.4	16.0
1997	259.7	622.0	16/17/10	39/15	33.3	15.9
1998	293.5	669.0	16/17/12	36/17	33.9	15.9
1999	317.1	762.9	15/17/12	36/18	55.3	21.6
2000	322.6	868.9	15/15/12	31/17	56.1	23.4
2001	354.1	927.7	12/11/12	29/29	57.5	27.2
2002	359.7	1,032.1	13/11/13	23/38	56.0	23.3
2003	363.6	1,044.2	13/10/13	16/34	51.9	20.8
2004	381.6	1,184.4	13/5/13	6/36	--[4]	20.0

[1] Mines include Buckskin, Rawhide, Eagle Butte, Dry Fork, Fort Union (acquired by Dry Fork), Clovis Point (acquired by Wyodak), Wyodak, Caballo, Belle Ayr, Caballo Rojo, Cordero, Coal Creek, Jacobs Ranch, Black Thunder, North Rochelle, North Antelope, Rochelle, Antelope, and Dave Johnston.

[2] Some sites include more than one sampler, so the number of samplers is greater than the number of sites.

[3] Not applicable because no monitoring for PM$_{10}$ was done.

[4] Data no longer pertinent due to paucity of monitoring sites.

Sources: 1980 through 1996 emissions and production data from April 1997 report prepared by WMA for WDEQ/AQD. 1997 through 2004 emissions data from EPA AirData and WDEQ/AQD databases (EPA 2005a, WDEQ/AQD 2005b). 1997 through 2004 production data from WDEQ/AQD and Wyoming State Inspector of Mines (WDEQ/AQD 2005c and Wyoming Department of Employment 1997-2004).

associated overburden production increased from 105 mmbcy to 669 mmbcy per year (an increase of over 600 percent). From 1990 through 2004, the average annual increase in coal production was 6.5 percent, while annual overburden production increased an average of 13.1 percent over the same time period. The larger annual increase in overburden production is probably due to the fact that the mines are gradually moving into deeper coals as the shallower reserves are mined out.

The relatively flat trend in particulate emissions from 1980 through 1998 is due in large part to the Wyoming Air Quality Program that requires BACT at all permitted facilities. BACT control measures, which include watering and chemical treatment of roads, limiting the amount of area disturbed, temporary revegetation of disturbed areas to reduce wind erosion, and timely final reclamation, are discussed in Section 3.4.2.3.

The average annual TSP concentration increased from 33.9 μg/m^3 in 1998 to 55.3 μg/m^3 in 1999, and has remained greater than 50.0 μg/m^3 since that time. The average annual PM$_{10}$ concentration increased from 15.9 μg/m^3 in 1998 to 21.6 μg/m^3 in 1999, and has remained equal to or greater than 20 μg/m^3 since that time. The increases in coal production over those six years (an average of 4.6 percent per year and 14.7 mmtpy over the six-year period) and associated overburden production (an average of 10.0 percent per year and 85.9 mmbcy over the six-year period) were not larger than any of the six-year increases during the previous 18 years, but the particulate concentration increase was much larger than in previous years. There were no major fires in the region between 1998 and the present but since 1999, the PRB of northeastern Wyoming has experienced extreme drought conditions as well as the dramatic increase in surface disturbance activities associated with CBNG development, which have exacerbated particulate emissions. The potential causes of and development of effective measures to limit the increasing annual particulate levels that have been documented through monitoring are of concern to air quality regulators as well as to oil and gas and coal operators in this area.

The PRB's monitoring history shows no exceedances of the annual PM$_{10}$ standard to date. There were no exceedances of the 24-hour PM$_{10}$ standards anywhere in the PRB through year 2000. From 2001 through 2005, there were 29 monitored exceedances of the 24-hour PM$_{10}$ standard at seven operating mines in the Wyoming PRB, five of which are located within the southern portion of the basin. Nineteen of these exceedances occurred in 2001 and 2002, while two, three, and five exceedances occurred in 2003, 2004, and 2005, respectively (Shamley 2006). Most of the exceedances (26) took place in the group of mines located south and east of the town of Wright; the remaining three exceedances occurred in the group of mines located north and east of Gillette (Figure 1-1). The group of mines located between Gillette and Wright, which includes the Cordero Rojo Mine, has not recorded any exceedances of the 24-hour PM_{10} standard. Each of the monitored exceedances of the PM_{10} 24-hour standard was associated with high winds and blowing dust following prolonged periods of low precipitation, which resulted in low soil moisture content.

According to the WDEQ/AQD, the circumstances associated with the exceedances have provided adequate reason to believe that high wind events and blowing dust have caused exceedances of the NAAQS that otherwise would not have occurred (WDEQ/AQD 2006). In response to the measured exceedances of the PM_{10} NAAQS and in anticipation of possible future exceedances, the WDEQ/AQD has collaborated with the Wyoming Mining Association to develop a Natural Events Action Plan for the coal mines of the PRB, based on EPA Natural Event Policy guidance. A report describing the plan, which has been submitted to the EPA for comment and approval, can be accessed on the WDEQ/AQD's website on the Internet (WDEQ/AQD 2006). If a Natural Events Action Plan is designed and implemented to minimize PM_{10} concentrations, EPA will exercise its discretion, under Section 107(d)(3) of the CAA, not to redesignate areas as nonattainment, provided that the exeedances are demonstrated to be the result of natural events. Based on EPA's Natural Events Policy, PM_{10} concentrations due to dust raised by unusually high winds will be treated as uncontrollable natural events under the following conditions: 1) the dust originated from non-anthropogenic sources, or 2) the dust originated from anthropogenic sources controlled with BACM.

The WDEQ/AQD Natural Events Action Plan includes a public education plan, a public notification and health advisory program, and a plan to abate or minimize appropriate contributing controllable sources of PM_{10}, which includes three categories of control measures. The three categories of control measures are discussed in Section 3.4.2.3, below. The Natural Events Action Plan currently proposed by WDEQ/AQD only includes measures for control of coal mine sources since it is the ambient monitoring systems around the large surface coal mines that have experienced exceedances of the NAAQS. If it is demonstrated that there are non-coal sources contributing to elevated measurements in an area of concern, WDEQ/AQD may address these additional sources separately from the proposed Natural Events Action Plan or as a future update of the plan.

3.4.2.1.2 Site Specific Particulate Emissions

For the Cordero Rojo Mine air quality monitoring sites, historical particulate matter ambient air quality data generally show the same results as described above for the PRB as a whole. The locations of PM_{10} and TSP particulate emission monitoring samplers at the Cordero Rojo Mine are shown on Figure 3-4. The progression of mining operations

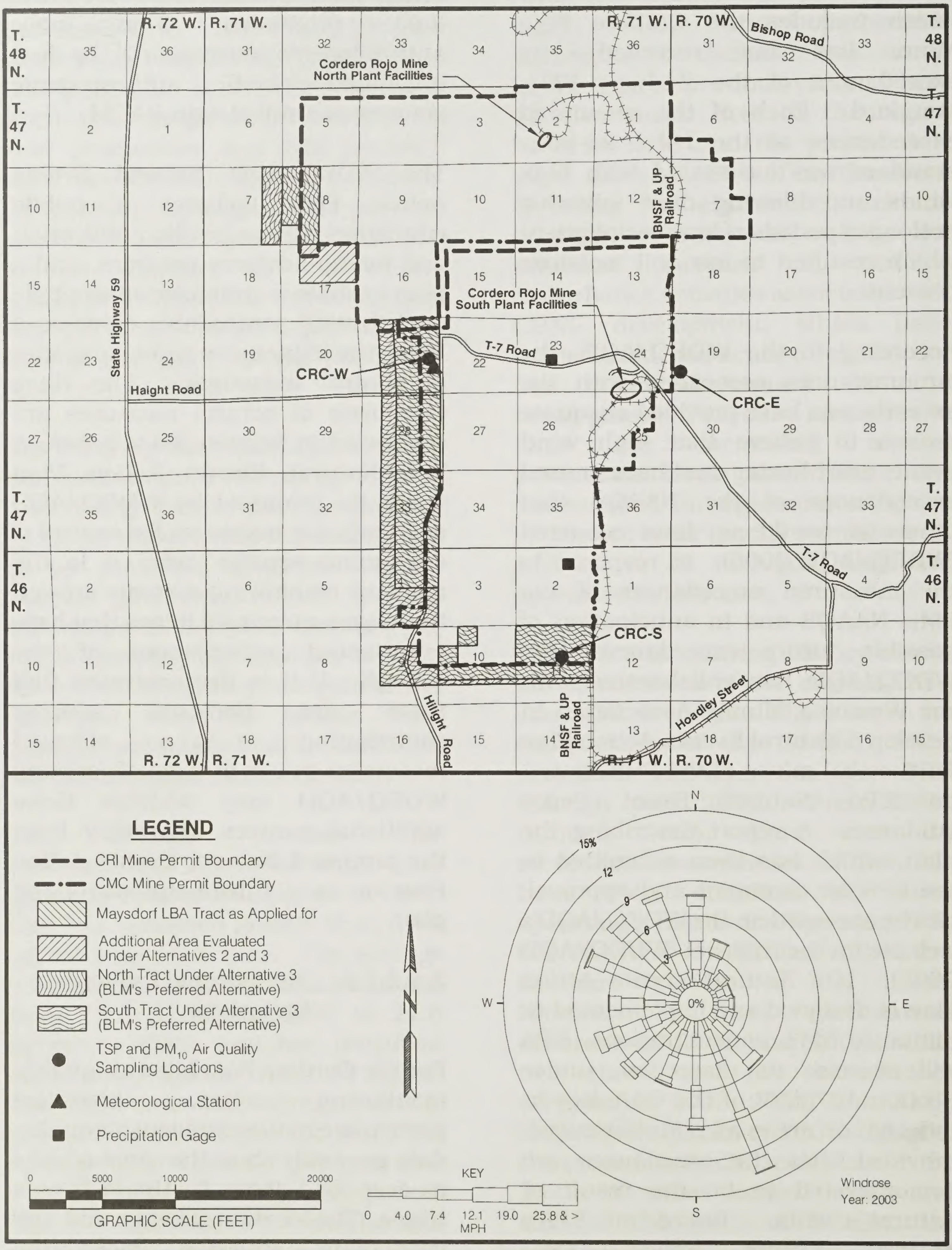

R. 72 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
Bishop Road
Cordero Rojo Mine North Plant Facilities
Cordero Rojo Mine South Plant Facilities
BNSF & UP Railroad
State Highway 59
Haight Road
T-7 Road
Hilight Road
Hoadley Street
CRC-W
CRC-E
CRC-S
LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
TSP and PM$_{10}$ Air Quality Sampling Locations
Meteorological Station
Precipitation Gage
0
5000
10000
20000
GRAPHIC SCALE (FEET)
N
S
E
W
15%
12
9
6
3
0%
KEY
0
4.0
7.4
12.1
19.0
25.8 & >
MPH
Windrose
Year: 2003

Figure 3-4. Wind Rose, Air Quality and Meteorological Stations at the Cordero Rojo Mine.

requires that the location and number of particulate monitors be adjusted in order to provide the best documentation of the ambient air quality. Figure 3-5 presents the average annual TSP and PM_{10} emission measured at Cordero Rojo Mine's particulate monitors from 1995 through 2004. Annual coal and overburden production for the Cordero Rojo Mine for these years (also shown on Figure 3-5) have generally increased like the overall coal and overburden production in the PRB as a whole.

As discussed above, TSP was the federally regulated pollutant until 1989 and was retained as a state regulated pollutant until 2000. PM_{10} became a federal standard in 1989 and was also adopted by the State of Wyoming. Until recently, TSP measurements have been used as a surrogate for PM_{10} in lieu of having to replace and/or co-locate an existing TSP sampler with a new PM_{10} sampler. The average annual TSP emission measured at Cordero Rojo Mine's Site CRC-E was exceeded in 1999 and 2000 (Figure 3-5); however, no violations of either the 24-hour or annual particulate standards (TSP or PM_{10}) at the Cordero Rojo Mine have been issued by the WDEQ/AQD. (See Chapter 7 for the definitions of "exceedance" and "violation".)

3.4.2.2 Environmental Consequences Related to Particulate Emissions

Particulates include solid particles and liquid droplets that can be suspended in air. Particulates, especially fine particles, have been linked to numerous respiratory-related illnesses and can adversely affect individuals with pre-existing heart or lung diseases. They are also a major cause of visibility impairment in many parts of the United States. While individual particles cannot be seen with the naked eye, collectively they can appear as black soot, dust clouds, or gray hazes.

3.4.2.2.1 Proposed Action and Alternatives 2 and 3

The Maysdorf LBA Tract would be mined as an integral part of the Cordero Rojo Mine. The average annual coal production is anticipated to remain at the projected post-2005 rate of 40 million tons, with or without the Maysdorf LBA Tract. Coal production is anticipated to increase to a maximum rate of 46 mmtpy, then taper off during the mine's later years, with or without the Maysdorf LBA Tract. Cordero Rojo Mine's currently approved air quality permit from the WDEQ/AQD limits annual coal production to 65 million tons of coal. If the mine acquires the additional coal in the LBA tract, they would continue to produce at an average rate of 40 mmtpy for a longer period of time (from six to nine years). Potential particulate emissions related to mining operations at the existing Cordero Rojo Mine are described below. Because of the similarities in mining rates and mining operations, the potential impacts of mining the Maysdorf LBA Tract have been inferred from the projected impacts of mining the existing coal leases as currently permitted.

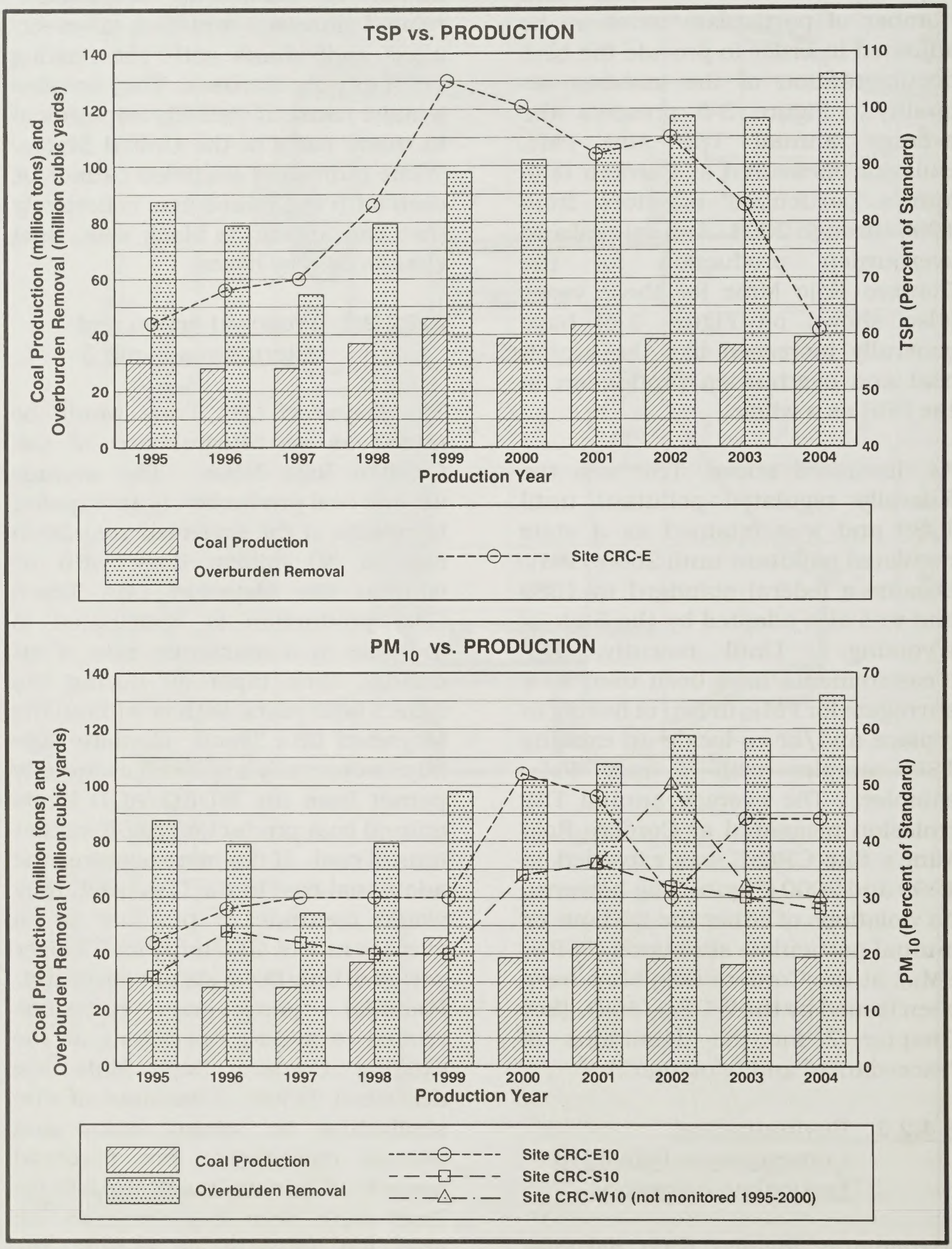


Figure 3-5. Annual Coal Production and Overburden Removal vs. Ambient Particulates for Cordero Rojo Mine (1995 through 2004).

WDEQ/AQD issued air quality permit MD-457A for the Cordero Rojo Mine on May 2, 2000. This air quality permit was issued based on an analysis using emission factors, estimation methods, and model selection consistent with WDEQ/AQD policy. This air quality permit consolidated the former Caballo Rojo and Cordero Mines into one facility called the Cordero Rojo Complex (now called the Cordero Rojo Mine) and reflects analyses based on a revised mine plan, a new LNCM boundary, and increase in the maximum coal production level from 60 mmtpy to 65 mmtpy (CMC 1999). WDEQ/AQD issued air quality permit MD-1058 on September 17, 2004 to modify operations at the Cordero Rojo Mine with the addition of atomizer/fogger dust control systems, which replaced existing conventional baghouses. Material movement utilizes draglines, shovels, and trucks for removal of overburden, and shovels and trucks for removal of coal (CMC 1999).

Particulate emission inventories for the mining activities at Cordero Rojo Mine were prepared for all years in the currently anticipated life of the mine. Two years, 2005 and 2007, were then selected for worst-case dispersion modeling of PM_{10} based on mine plan parameters and emission inventories. Area and line sources were modeled using the FDM to estimate average annual PM_{10} concentrations and the ISCLT3 Model was used to model all point sources.

Receptor locations were placed at approximately 500-meter intervals along the ambient air quality (or LNCM) boundary (see Figures 3-6 and 3-7). As discussed in Section 3.4.1.1.1, a PM_{10} concentration of 15 $\mu g/m^3$ was added to all modeled emissions to account for background fugitive dust. Predicted PM_{10} emissions from the other regional mining operations were inventoried using those mines' most recent WDEQ/AQD air quality permit applications. Impacts on ambient air from the Cordero Rojo Mine and other regional mines vary by year due to annual changes in emission strength, emission density, pit proximity to defined ambient air boundaries, and pit configuration. Emissions for each year are ranked and candidate worst-case years are further evaluated regarding proximity to neighboring mining operations and emissions. The total PM_{10} concentration at each receptor was determined by summing the concentration due to each active mine in the general area and adding the background concentration of 15 $\mu g/m^3$. The resulting particulate levels were then compared to the average annual PM_{10} standard of 50 $\mu g/m^3$ to determine compliance with the annual WAAQS. This constitutes a demonstration of compliance with the "long-term" or annual WAAQS.

Long-term modeling indicates the currently projected mine activities will be in compliance with the annual PM_{10} ambient air standard for the life of the Cordero Rojo Mine. Based on mine plan parameters and highest emissions inventories, the years 2005 and 2007 were selected as the worst-case years. The dispersion model showed a maximum concentration of 46.56 $\mu g/m^3$ in 2005 and 45.66 $\mu g/m^3$ in 2007. Coal production in both years was projected to be the

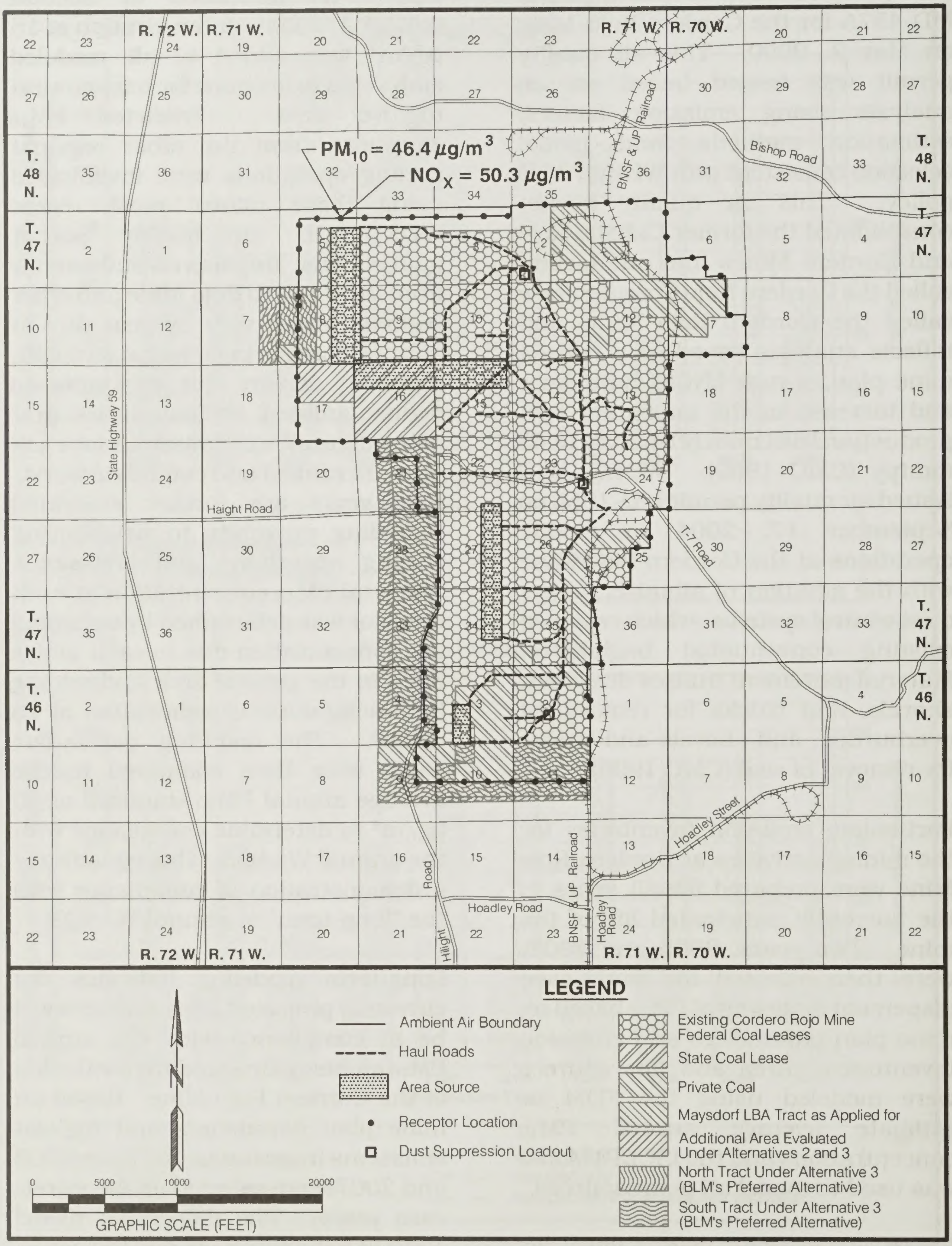

PM10 = 46.4 µg/m3
NOX = 50.3 µg/m3
R. 72 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
State Highway 59
Haight Road
BNSF & UP Railroad
Bishop Road
T-7 Road
Hoadley Street
Hoadley Road
Hilight Road
LEGEND
Ambient Air Boundary
Haul Roads
Area Source
Receptor Location
Dust Suppression Loadout
Existing Cordero Rojo Mine Federal Coal Leases
State Coal Lease
Private Coal
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
0
5000
10000
20000
GRAPHIC SCALE (FEET)
N

Figure 3-6. Maximum Modeled PM_{10} and NO_X Concentrations at the Cordero Rojo Mine Ambient Air Boundary for the Year 2005.

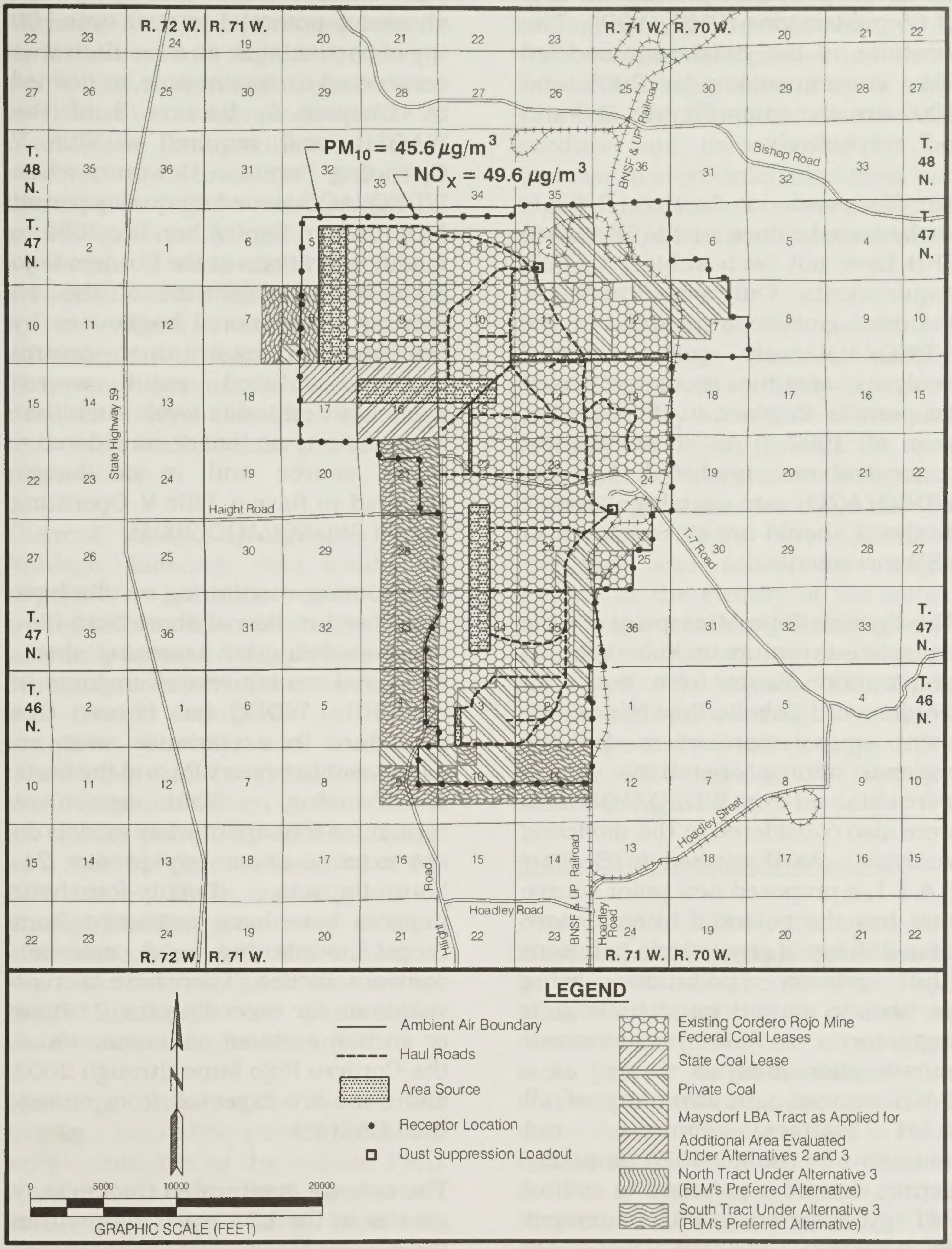

R. 72 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
PM_{10} = 45.6 µg/m^3
NO_X = 49.6 µg/m^3
Bishop Road
BNSF & UP Railroad
State Highway 59
Haight Road
T-7 Road
Hoadley Street
Hoadley Road
Hilight Road
LEGEND
Ambient Air Boundary
Haul Roads
Area Source
Receptor Location
Dust Suppression Loadout
Existing Cordero Rojo Mine Federal Coal Leases
State Coal Lease
Private Coal
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure 3-7. Maximum Modeled PM_{10} and NO_X Concentrations at the Cordero Rojo Mine Ambient Air Boundary for the Year 2007.

maximum permitted production level of 65 million tons (CMC 1999). The locations of the maximum-modeled PM_{10} concentrations for 2005 and 2007 are shown on Figures 3-6 and 3-7, respectively.

As discussed in Section 3.4.1.1, surface coal mines in the Wyoming PRB have not been subject to PSD requirements. Only some fraction of the mine emissions included in the WDEQ/AQD air quality permit analyses consumes increment based on permits in place in the baseline year of 1997. As a result, the concentrations predicted by the WDEQ/AQD air quality permit analyses should not be compared to PSD increments.

The Cordero Rojo Mine point source emissions inventory includes the coal preparation plants from both the Cordero and Caballo Rojo Mines. All point source parameters for the regional mining operations, which were obtained from WDEQ/AQD files, were also considered in the modeling analysis. As discussed in Section 3.4.1.1, a proposed new point source that has the potential to emit more than 250 tpy of any criteria pollutant (the primary pollutant being particulate matter) must undergo a regulatory PSD increment consumption analysis as well as a BACT review. An inventory of all point sources, controls, and emissions for the MD-457A air quality permit showed a potential to emit of 241 tpy; therefore, a PSD increment consumption analysis was not necessary.

The MD-457A air quality permit showed a potential to emit over 100 tpy of particulates; as a result, it was considered a major source, as defined by Chapter 6, Section 3 of the WAQSR, and required a Title V Operating Permit. However, when WDEQ/AQD issued air quality permit MD-1058 on September 17, 2004 to modify operations at the Cordero Rojo Mine, the replacement of the 14 existing conventional baghouses by the atomizer/fogger dust control systems reduced point source particulate emission levels such that the facility is no longer considered a major source and is no longer required to have a Title V Operating Permit (WDEQ/AQD 2004).

In Wyoming, monitoring results have been used in lieu of short-term (24-hour) modeling for assessing short-term coal mining-related impacts in the PRB. WDEQ has chosen this procedure in accordance with an agreement between EPA and the State of Wyoming. That agreement recognizes that appropriate models do not exist to accurately predict 24-hour impacts. Twenty-four-hour impacts have been estimated from recent monitoring and emission control activities. There have been no violations for exceeding the 24-hour or annual ambient air standards at the Cordero Rojo Mine through 2005 and none are expected from mining the LBA tract.

The average overburden thickness is greater in the LBA tract than within the current leases, but the thickness of the coal in the LBA tract is about the same as in the existing mine area (see Table 3-2). If the Cordero Rojo

Mine acquires and mines the Maysdorf LBA Tract, this could result in an increase in fugitive emissions per ton of coal mined from current levels due to the increased volume of overburden that would have to be removed to recover the coal. The increase in fugitive dust emissions could potentially be moderated somewhat if removal of the larger volume of overburden material results in a slower rate of mining advancement through the LBA tract. This would potentially decrease the number of acres disturbed annually and cause haul distances to increase more slowly.

Current mining techniques (i.e., haulage, blasting, etc.) would be expected to continue for a longer period of time than is shown in the currently approved air quality permit. Material movement of overburden and coal would continue to utilize draglines, shovels, and trucks in overburden and shovels and trucks in coal. Facilities shown in the current air quality permit would not change as a result of proposed mining of the LBA tract. There are no plans to change blasting procedures or blast sizes associated with the mining of the LBA tract. In addition, current BACT measures for particulates would continue to be employed.

Modeling conducted for the current Cordero Rojo Mine permit predicted no exceedances of the annual PM_{10} NAAQS at a 65-mmtpy production rate and there have been no exceedances of the 24-hour and annual PM_{10} NAAQS. If the Cordero Rojo Mine acquires and mines the Maysdorf LBA Tract, they estimate that the mine would produce at an average annual rate of 40 mmtpy. At that average rate of production, there would be an extension of up to nine years in the time the mine would produce and there would be an increase in overburden thickness, but fugitive dust emissions are projected remain within daily and annual AAQS limits.

Public exposure to particulate emissions from surface mining operations is most likely to occur along publicly accessible roads and highways that pass through the area of the mining operations. Occupants of dwellings in the area could also be affected. There are occupied dwellings and school bus stops located in the vicinity of the mine, including several along State Highway 59, which is located from two to three miles west of the Maysdorf LBA Tract. Roads, highways, currently occupied dwellings, and school bus stops in the vicinity of the Maysdorf LBA Tract are shown in Figure 3-8.

3.4.2.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and the Cordero Rojo Mine would continue to operate as currently permitted for about nine more years. A discussion of the currently permitted mining operations and potential impacts related to PM_{10} emissions is included in Section 3.4.2.2.1, above. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases. Impacts related to mining operations at the Cordero Rojo

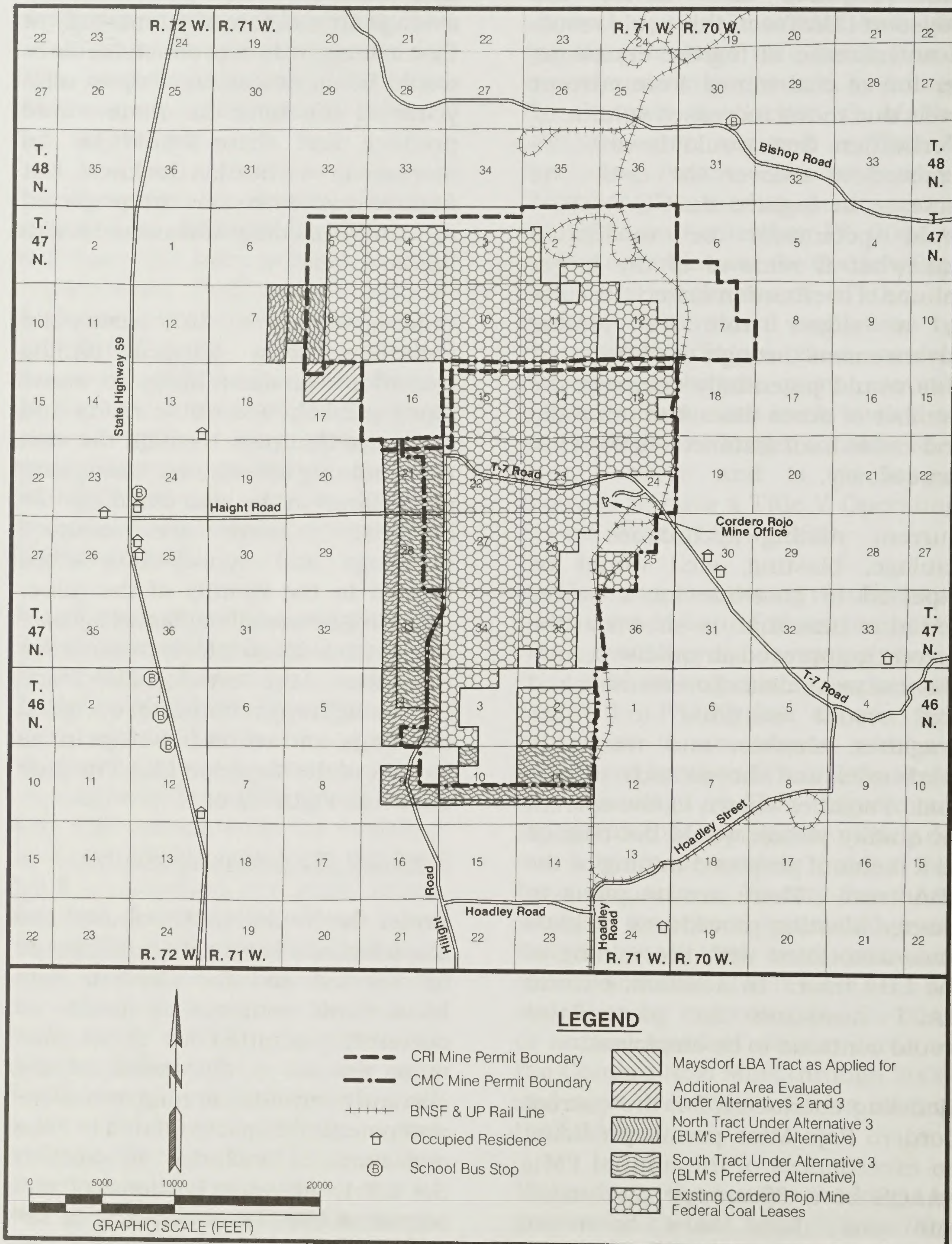

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
State Highway 59
Bishop Road
Haight Road
T-7 Road
Cordero Rojo Mine Office
Hoadley Street
Hoadley Road
Hilight Road
Hoadley Road
LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
BNSF & UP Rail Line
Occupied Residence
School Bus Stop
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
Existing Cordero Rojo Mine Federal Coal Leases
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure 3-8. Residences, School Bus Stops, Public Roads, and other Publicly Accessible Facilities Within and Adjacent to the Maysdorf LBA Tract.

Mine would continue on the existing mine area as permitted, but mining operations would not be extended onto those portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.4.2.3 Regulatory Compliance, Mitigation, and Monitoring for Particulate Emissions

Control of particulate emissions at all PRB coal mines is accomplished with a variety of measures. The WDEQ/AQD permits for all of the surface coal mines in the PRB require the following dust control measures, which are considered to be BACT measures:

- No mines are allowed to have out-or-pit open coal stockpiles. All coal removed from the mine pits must be stored in totally enclosed coal silos or barns.
- Unless specifically exempted, all coal mine main access roads are paved.
- As use and condition warrant, the minor access roads at coal mines that are unpaved must be watered or treated with dust suppressants.
- All coal conveyor transfer points are shrouded or otherwise enclose to direct coal fines from one belt to the next.
- The transfer point and crushers within coal processing plants are equipped with control devices and measures specified in individual permits. These control devices and measures may include, but are not limited to, the use of dust collection baghouses, cyclones, scrubbers, fog systems, and controlled flow transfer chutes.
- All out-of-pit conveyors are hooded or contained in a conveyor gallery.
- All out-of-pit coal dump hoppers are fitted with a dust control stilling shed, water sprays, or a baghouse dust collector.
- Active longer-term coal haul roads are treated with dust control chemicals and/or water.
- Active short-term mine haul roads that are continuously being relocated are maintained and watered while in use.
- All haul roads are regularly maintained to reduce the amount of dust re-entrained by haulage equipment (WDEQ/AQD 2006).

Additional site-specific requirements related to mine-specific layout and mining practices may be included in individual mine permits. In 2000, when the Cordero Rojo Mine's MD-

457A air quality permit was issued, the BACT on emissions from the mine's point sources included stilling sheds, covered conveyors, telescoping loadout chutes, enclosed storage devices (silos), and dust collectors (baghouses) at all coal transfer points. As discussed above, WDEQ/AQD issued air quality permit MD-1058 to modify operations at the Cordero Rojo Mine with the addition of atomizer/fogger dust control systems that replaced existing conventional baghouses in 2004.

Fugitive emissions are also controlled with a variety of other measures that the WDEQ/AQD considers BACT. Haul truck speed limits are imposed to further help to reduce fugitive emissions from roads. Material drop heights for shovels and draglines (bucket to truck bed or backfill) are limited to the minimum necessary to conduct the mining operations. Timely permanent and temporary revegetation of disturbed areas is utilized to minimize wind erosion. All of these control measures are employed at the Cordero Rojo Mine.

The Natural Events Action Plan discussed in Section 3.4.2.1.1 identifies two other categories of control measures designed to prevent exceedances during high wind events, in addition to the BACT measures discussed above (WDEQ/AQD 2006). One of these, BACM, is an additional list of control measures that the mines can implement continuously so that they are in place before a high wind event occurs. These measures are not current requirements in all of the mines' air quality permits. They primarily address the principal mine-controlled sources of fugitive dust, which are large contiguous disturbed areas. These measures include:

- Stabilizing topsoiled area as soon as practicable following topsoil replacement.
- Ripping, windrowing, mulching, temporarily seeding or chemically treating areas greater than 300 contiguous acres in size that have been stripped of topsoil but will not be mined in the near future.
- Ripping, windrowing, temporarily seeding or chemically treating graded backfill areas greater than 300 contiguous acres in size.
- Ripping, mulching, temporarily seeding or chemically treating long-term out-of-pit overburden and topsoil stockpiles that have been graded.
- Applying non-vegetative barriers such as gravel or other large-diameter particles to erodible surfaces to reduce surface erosion where appropriate.
- Cleaning, treating, and maintaining pads in front of truck dumps to prevent accumulations of spilled materials from getting pulverized.
- Scheduling topsoil removal, backfill grading and topsoil replacements concurrently to

minimize open areas when possible.

- Requiring contractors to apply water and/or chemical dust suppressants in their haulage areas.

The third category of control measures discussed in the Natural Events Action Plan includes measures that are not currently required by all individual air quality permits but are actions that can be taken during a high wind event, depending on site specific conditions (WDEQ/AQD 2006). These include:

- The mine operator will consider relevant information, including NWS forecasts and local meteorological information, to confirm that a high wind event is occurring.
- The mine operator will visually determine areas of mining activity that are generating excessive visible dust and direct water trucks to those areas.
- The mine operator should direct overburden operations to the shortest haul distance available during a high wind event.
- The mine operator will evaluate the practicality of dumping the overburden as low as possible.
- Mine employees will inspect for and extinguish coal fires.
- The mine operator will evaluate shutting down scoria crushing operations that appear to be generating excess dust.
- The mine operator will evaluate shutting down road maintenance activities that are generating dust.
- The mine operator will evaluate ordering contractors to increase water, reduce operating equipment or shut down haulage.
- The mine operator will evaluate the need to shut down and/or reduce earthmoving activities as the mine schedule and conditions will allow.

WDEQ/AQD may require implementation of these control steps and continual evaluation of activity plans when exceedances are monitored at surface coal mines. Some of these measures have been formally implemented at the Black Thunder, North Rochelle, and Jacobs Ranch Mines through the establishment of a formal, site-specific mitigative response plan at each of those mines. A mitigative response plan will be developed by any mine that records an exceedance or violation of the NAAQS downwind of its mining operations.

Other operational control measures that WDEQ/AQD may require at specific mines when exceedances occur include, but are not limited to, relocation of overburden truck-dumping operations and deferring blasting. The mines are experimenting with dust control treatments, including magnesium chloride, surfactants, and petroleum-based products. In addition, WDEQ/AQD may require additional monitoring, action levels based on continuous monitoring, expedited reporting of monitored exceedances, detailed reporting of contributing factors (e.g., meteorological conditions), and continual evaluation of activity plans when exceedances are monitored at surface coal mines.

The WDEQ/AQD is continually reviewing the data and considering regulatory options, such as increasing the frequency of monitoring. Where elevated emissions have occurred, continuous PM_{10} monitors, or TEOMs, are installed, which allows monitoring of emissions on a real-time basis (WDEQ/AQD 2006). Other regulatory options may include enforcement actions such as Notices of Violation resulting in a consent decree and/or modified permit conditions. WDEQ/AQD is also coordinating with EPA to develop additional monitoring requirements in CBNG development areas, high PM_{10} mitigation action plans in permits, and additional mitigation measures under the State Implementation Plan.

The eastern side of the PRB has one of the most extensive networks of monitoring sites for PM_{10} in the nation (Figure 3-3). The monitors include six TSP monitors, four $PM_{2.5}$ monitors and 30 PM_{10} monitors, including TEOMs. This count does not include collocated monitors installed for quality assurance purposes in this area. Most of these monitoring sites are funded and operated by the coal mines. WDEQ/AQD requires the collection of information documenting the quality of the air resource at each of the PRB mines. Each mine monitored air quality for a 24-hour period every six days at multiple monitoring sites through the end of 2001. All PM_{10} monitors located at the active mines are now required by WDEQ/AQD to sample air quality for a 24-hour period every three days beginning in 2002.

There are also monitors in Sheridan, Gillette, Arvada, and Wright, Wyoming. WDEQ/AQD uses monitoring stations located throughout the state to anticipate issues related to air quality. These monitoring stations are located to measure ambient air quality; they are not located to measure impacts from specific sources. Monitors located to measure impacts from specific sources may also be used for trends. The extensive air quality monitoring network currently in use enables the WDEQ to manage the air resource using monitoring data rather than modeled predictions. WDEQ uses the monitoring data to pro-actively arrest or reverse trends towards air quality problems. When WDEQ became aware that particulate readings in the PRB were increasing due to increased CBNG activity and exacerbated by prolonged drought, the WDEQ approached the counties, coal mines, and CBNG industry. A coalition involving the Campbell County Commission, coal companies (including the Cordero Rojo Mine), and regional CBNG and oil producing operators have made significant efforts towards minimizing dust from graded roads. Measures taken have ranged from the implementation of speed limits to paving of heavily traveled roads. The coalition has utilized chemical treatments to control dust as well as closing roads where appropriate or necessary and rebuilding existing roads to higher specifications. The coalition is requesting money from the Wyoming State Legislature to fund acquisition of Rotomill (ground up asphalt) which would be mixed with gravel and used to treat some of the roads in the PRB. The Rotomill/gravel mixture has been demonstrated to be effective in reducing dust and the life of the mixture on treated roads is from five to six years (WDEQ/AQD 2007).

Monitoring is also used to measure compliance. When monitoring shows that any standard has been violated, the WDEQ can take a range of enforcement actions to remedy the situation. Where a standard is exceeded specific to an operation, the enforcement action is specific to the facility. For many facilities, neither the cause nor the solution is simple. The agency normally uses a negotiated settlement in those instances.

3.4.3 Emissions of Nitrogen Oxides (NO_x)

3.4.3.1 Affected Environment for NO_x Emissions

Gases that contain nitrogen and oxygen in varying amounts are referred to as nitrogen oxides, or NO_x. One type of NO_x is nitrogen dioxide (NO_2), a reddish brown gas that is heavier than air and has a pungent odor. Gaseous NO_2 is highly reactive and combines with water to form nitric acid and nitric oxide. According to the EPA (EPA 2001a):

- NO_x gas may cause significant toxicity because of its ability to form nitric acid with water in the eye, lung, mucous membranes, and skin.
- Acute exposure may cause death by damaging the pulmonary system.
- Chronic or repeated exposure to lower concentrations of NO_2 may exacerbate pre-existing respiratory conditions, or increase the incidence of respiratory infections.

The primary direct source of emissions of nitrogen oxides during coal mining operations is tailpipe emissions from large mining equipment and other vehicle traffic inside the mine permit area. Blasting that is done to remove the material overlying the coal (the overburden) can result in emissions of several products, including NO_2, as a result of the incomplete combustion of explosives used in the blasting process. When this occurs, gaseous, orange-colored clouds may be formed and they can drift or be blown off mine permit areas.

3.4.3.1.1 Regional NO_x Emissions

Annual mean NO_2 concentrations have been periodically measured in the PRB since 1975, as discussed in Section 3.4.3.3. The annual mean NO_2 concentrations recorded by those monitoring efforts have all been well below the 100 μg/m³ standard. The highest annual mean concentration recorded to date was 22 μg/m³ at two separate sites between March 1996 and April 1997.

NO_2 is a product of incomplete combustion at sources such as gasoline- and diesel-burning engines or from mine blasting activities. Incomplete combustion during blasting may be caused by wet conditions, incompetent or fractured geological formations, deformation of bore holes, and other factors. Generally, blasting-related NO_x emissions are more prevalent at operations that use the blasting technique referred to as cast blasting (Chancellor 2003). Cast blasting refers to a type of direct blasting in which the blast is designed to cast the overburden from on top of the coal into the previously mined area.

In the mid-to late-1990s, OSM received complaints from several citizens about blasting clouds from several mines in the PRB. EPA expressed concerns that NO_2 levels in some of those blasting clouds may have been sufficiently high at times to cause human health effects. In response to those concerns, several studies have been conducted, the mines have modified their blasting techniques, and the WDEQ has imposed blasting restrictions on several mines. More information about these studies and restrictions is presented in the following discussion.

3.4.3.1.2 Site Specific NO_x Emissions

Sources of NO_x emissions at the Cordero Rojo Mine include the tailpipe emissions from the mining equipment and the emissions from the trains used to haul the coal from the mine. There are no NO_x point sources at the mine.

To date, there have been no reported events of public exposure to NO_2 from blasting activities at the Cordero Rojo Mine. The WDEQ has not required the mine to implement any specific measures to control or limit public exposure to NO_2 from blasting.

3.4.3.2 Environmental Consequences Related to NO_x Emissions

Although there is no NAAQS that regulates short-term NO_2 levels, there is concern about the potential health risk associated with short-term exposure to NO_2 from blasting emissions. According to EPA, NO_x may cause a wide variety of health and environmental impacts because of various compounds and derivatives in the family of nitrogen oxides, including NO_2, nitric acid, nitrous oxide, nitrates, and nitric oxide. Potential health risks associated with short term exposure to NO_2 include changes in airway responsiveness and lung function in individuals with pre-existing respiratory illnesses and increases in respiratory illnesses in children. Long-term exposure to NO_2 may lead to increases susceptibility to respiratory infection and may cause irreversible alterations in lung structure (EPA 2006a and 2006b).

NIOSH, OSHA, and EPA have identified the following short-term exposure criteria for NO_2:

- NIOSH's recommended Immediately Dangerous to Life and Health level is 20.0 ppm (37,600 μg/m^3);
- EPA's Significant Harm Level, a one-hour average, is 2.0 ppm (3,760 μg/m^3);
- OSHA's Short-Term Exposure Limit, a 15-minute time-weighted average, which was developed for workers, is 5.0 ppm (9,400 μg/m^3), which must not be exceeded during any part of the workday, as measured instantaneously);
- NIOSH's recommendation for workers is a limit of 1.0 ppm (1,880 μg/m^3) based on a 15-minute exposure that should not be exceeded at any time during the workday; and
- EPA recommends that concentrations not exceed 0.5 ppm (940 μg/m^3) for a 10-minute exposure to protect sensitive members of the public (EPA 2003).

A study conducted by Dr. Edward Faeder for the Black Thunder Mine (Figure 1-1) recommended a limit of 5.0 ppm (9,400 μg/m^3) for a 10-minute exposure.

According to EPA "...the exact concentrations at which NO_2 will cause various health effects cannot be predicted with complete accuracy because the effects are a function of air concentration and time of exposure, and precise measurements have not been made in association with human toxicity. The information that is available from human exposures also suggests that there is some variation in individual response" (EPA 2001a).

he WMA conducted a study beginning in August 1999 and completed in April 2000, with participation from the WDEQ/LQD and WDEQ/AQD, because of the concern with the health risk that could be potentially associated with short-term exposure to NO_x. The study involved collection of 15-minute average NO_2 concentrations in areas that are near PRB coal mining operations and that would be accessible to the public. It was designed to help evaluate potential exposure of the public to NO_2 emissions resulting from blasting activity at surface coal mines. Six monitor locations were selected "...based on their proximity to mining activity and accessibility to the public. Roads adjacent to mining activity were felt to be areas where the public exposure would most likely occur. Locations were also chosen based on dominant wind direction, and to represent areas having the greatest chance of being impacted by several mining operations..." (WMA 2000).

A brief summary of the findings follows:

- Approximately 95 percent of the valid data points were readings of 0 ppm (0 μg/m^3) NO_2.

- The maximum 15-minute average valid values observed for each of the six monitors ranged from 0 to 1.65 ppm (0 - 3,102 μg/m³) NO_2.
- Where readings greater than 0 ppm did occur, there was a strong correlation between NO_2 readings and temperatures. This correlation indicates that the NO_2 readings may have been inflated due to temperature considerations.

The Black Thunder Mine also conducted a study designed to provide information on safe setback distances for blasting activities at that mine (TBCC 2002). Monitors for that report were located close to blasts in order to collect data for a modeling project; they were located within the mine permit boundary in areas that are not and would not be accessible to the public during mining operations and these areas are also cleared of employees during blasting activities. The measured NO_x levels ranged from non-detectable to 21.4 ppm. The highest value was measured 361 ft from the blast.

There are no state or federal rules that require the public or employees to stay back a certain distance from mine blasting operations in order to limit their exposure to NO_2. An administrative ruling by the Wyoming EQC in 2003 approved a 2,500-ft setback of blasting operations from the southern boundary of the Eagle Butte Coal Mine when prevailing winds are blowing toward the mine's downwind neighbors (Wyoming EQC Docket No. 00-4802, filed June 26, 2003). The Eagle Butte Mine is located just north of Gillette (Figure 1-1).

3.4.3.2.1 Proposed Action and Alternatives 2 and 3

The Maysdorf LBA Tract would be mined as an integral part of the Cordero Rojo Mine. The average annual coal production is anticipated to remain at the projected post-2005 rate of 40 million tons, with or without the Maysdorf LBA Tract. Coal production is anticipated to increase to a maximum rate of 46 mmtpy, then taper off during the mine's later years, with or without the Maysdorf LBA Tract. Cordero Rojo Mine's currently approved air quality permit from the WDEQ/AQD allows up to 65 million tons of coal to be mined per year. If the mine acquires the additional coal in the LBA tract, they would continue to produce at an average rate of 40 mmtpy for a longer period of time (six to nine years). Potential NO_x emissions related to mining operations at the existing Cordero Rojo Mine are described below.

The WDEQ/AQD has determined that an assessment of annual NO_x impacts must be included as part of an air quality permitting analysis for new surface coal mines and existing mine plans revisions. As discussed in Section 3.4.2.2, WDEQ/AQD issued air quality permit MD-457A for the Cordero Rojo Mine on May 2, 2000, and the mine was required to conduct NO_2 dispersion modeling in their permit. Emission rates were determined for the same worst-case years used in the PM_{10} modeling. The amount of NO_x emissions from blasting is related to the amount of ANFO utilized. NO_x emission rates for 2005 and 2007 are expected to be 569.7 tpy and 610.0 tpy, respectively. NO_x modeling closely followed many of the same procedures used in the PM_{10} analysis. Emissions were apportioned in a similar manner and the same meteorological data set was used. Only the Cordero Rojo Mine was modeled, regional activity was not considered. No NO_x point sources exist at the mine and the regional background NO_x annual concentration used was 20 $\mu g/m^3$. Additional area sources and line sources were added to describe the railroad tracks/loops on the Cordero Rojo Mine site. Long-term modeling indicated the currently projected mine activities will be in compliance with the annual NO_x AAQS for the life of the Cordero Rojo Mine. For year 2005, the maximum annual NO_x concentration was 50.3 $\mu g/m^3$ and for year 2007, the maximum annual NO_x concentration was 49.6 $\mu g/m^3$ (CMC 1999). Coal production in both years was assumed to be the maximum permitted production level of 65 million tons. The locations of the maximum-modeled NO_x concentrations for 2005 and 2007 are shown on Figures 3-6 and 3-7, respectively. The potential NO_x impacts from mining the Maysdorf LBA Tract have been inferred to be similar to the currently permitted impacts of mining the existing coal leases at the Cordero Rojo Mine because of the similarities in mining rates and mining operations.

The average overburden thickness is greater in the LBA tract than within the current leases, but the thickness of the coal is about the same as in the existing mine area (Table 3-2). If the Cordero Rojo Mine acquires and mines the Maysdorf LBA Tract, there are no plans to change blasting procedures or blast sizes associated with the mining of the LBA tract. However, if the average annual rate of production is maintained, there would potentially be an increase in the frequency of blasting in order to remove the additional volume of overburden overlying the coal.

There have been no reported events of public exposure to NO_2 from blasting activities at the Cordero Rojo Mine through 2005. The mine has, however, employed measures to control/limit public exposure to intermittent, short-term (blasting) releases as discussed in Section 3.4.3.3. Public exposure to emissions caused by surface mining operations is most likely to occur along publicly accessible roads and highways that pass through the area of the mining operations. Occupants of dwellings in the area could also be affected. There are occupied dwellings located approximately one to 3.5 miles west, two miles south-southeast, and 3.5 miles east of the LBA tract, and a school bus stop is located on Highway 59 approximately 2.5 miles west of the LBA tract (Figure 3-8).

If Cordero Rojo Mine acquires the Maysdorf LBA Tract, current mining techniques (i.e., blasting, excavating, hauling, etc.) would be expected to continue for a longer period of time than is shown in the currently approved air quality permit. Modeling for the current Cordero Rojo Mine permit projected no exceedances of the annual NO_x NAAQS at a 65-mmtpy production rate. Therefore, air quality impacts that result from mining the Maysdorf LBA Tract by the applicant at an estimated average rate of 40 mmtpy should also be within annual NAAQS limits.

3.4.3.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and the Cordero Rojo Mine would continue to operate as currently permitted for about nine more years. A discussion of the currently permitted mining operations and potential impacts related to NO_x emissions is included in Section 3.4.3.2.1, above. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases, but coal removal would not occur on the LBA tract and impacts related to mining operations would not be extended onto those portions of the LBA tract that will not be affected under the current mine plan.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.4.3.3 Regulatory Compliance, Mitigation, and Monitoring for NO_x Emissions

Several of the surface coal mines in the PRB have undertaken voluntary blasting restrictions to avoid NO_x impact to the public. WDEQ has required several mines, including Antelope, North Antelope/Rochelle, Black Thunder, Belle Ayr, Eagle Butte, and Wyodak (Figure 1-1), to stop traffic on public roads during blasting due to concerns with fly rock and the "startle factor".

To date, there have been no reported events of public exposure to NO_2 from blasting activities at the Cordero Rojo Mine. The WDEQ has not required the mine to implement any specific measures to control or limit public exposure to NO_2 from blasting, although the mine has voluntarily committed to control blasting emissions. Public access to some of the roads in the area, including the Haight, Hilight, and T-7 Roads, are currently blocked and will continue to be blocked during blasting operations when wind directions or proximity to the road warrant such closure. The Cordero Rojo Mine strictly adheres to a self-implemented Environmental Management System, which includes a detailed blasting procedures plan.

Voluntary measures that have been instituted, particularly when large blasts are planned include:

- telephone notification of neighbors (both private parties and other mining operations) in the general area of the mine prior to large blasts;
- monitoring of weather and atmospheric conditions prior to the decision to detonate a large blast;
- minimizing blast size to the extent possible;

- posting of signs on major public roads that enter the general mine area and on all locked gates accessing the active mine area;

- closing public roads that enter the general mine area, depending on wind conditions and blast location with respect to the road; and

- providing post-blast notification to neighbors of potential exposure to the blasting cloud.

Two mines in the Wyoming PRB, Black Thunder and Eagle Butte, currently have blasting restrictions in their permits to address NO_x. After WDEQ received reports of public exposure to NO_2 from blasting operations at some of the PRB mines prior to 2001, measures to prevent future such incidences were instituted at those mines when large overburden blasts are planned. Measures that have been instituted as mine permit requirements include:

- notification of neighbors and workers in the general area of the mine prior to the blast;

- blast detonation between 12:00 p.m. and 3:00 p.m. whenever possible to avoid temperature inversions and minimize inconvenience to neighbors;

- monitoring of weather and atmospheric conditions prior to the decision to detonate a blast;

- posting of signs on major public roads that enter the general mine area and on all locked gates accessing the active mine area;

- closing public roads when appropriate to protect the public; and

- as mentioned above, the Wyoming EQC approved a 2,500 ft setback of blasting operations from the southern boundary of the Eagle Butte Mine when prevailing winds are blowing toward the mine's downwind neighbors.

Mine operators in the eastern PRB have also been working with blasting agent manufacturers to reduce NO_x emissions. Efforts to eliminate NO_x production have included use of different blasting agents, different blends of blasting agents, different additives, different initiation systems and sequencing, borehole liners, and smaller cast blasts. Operators have tried adding substances like microspheres and rice hulls, using different blends of ANFO and slurries and gels, using electronic detonation systems that can vary shot timing, different shot hole patterns, and using plastic liners within the shot holes. No one single procedure or variation has proven consistently successful due to the numerous factors that are believed to contribute to the production of NO_2. The most successful control measure has been reducing the size of the cast blasting shots (Doug Emme 2003, Rick Chancellor 2003). The Eagle Butte Mine has almost eliminated NO_x production, while the North Antelope/Rochelle Mine has had success in eliminating NO_x in over 75 percent of their cast blasting through the use of borehole liners and changing their blasting agent blends (Chancellor 2003). Both mines are shown in Figure 1-1.

NO_2 was monitored from 1975 through 1983 in Gillette and from March 1996 through April 1997 at four locations in the PRB. Table 3-6 summarizes the results of that monitoring.

Due to public concerns about emissions of nitrogen dioxides as a result of blasting and a general concern of the WDEQ about levels of nitrogen dioxides due to development of all types in the eastern PRB, the coal mining industry instituted a monitoring network in cooperation with WDEQ/AQD to gather data on NO_2 beginning in 2001. Industry funded and operated the network for approximately three years. The 2001 through 2004 data from this regional network are summarized in Table 3-7.

The WDEQ now funds and operates the NO_2 monitoring network along the east side of the basin. Ownership of the monitoring equipment was transferred to WDEQ by the mines and the mines have given ongoing access to the monitoring sites and provide electrical power for the instrumentation.

As represented by Table 3-7, NO_2 monitoring data are available from five currently active sites in the PRB. With respect to the Maysdorf LBA Tract, the Thunder Basin National Grassland Site is approximately 50 miles north-northeast; the Campbell County Site is approximately 15 miles west-northwest; the Tracy Ranch Site

Table 3-6. Annual Ambient NO_2 Concentration Data.

Site	Gillette, WY	Black Thunder Mine	Belle Ayr Mine	Bill, WY
Year	**Percent of Standard[1]**	**Percent of Standard[1]**	**Percent of Standard[1]**	**Percent of Standard[1]**
1975	6*			
1976	4*			1*
1977	4*			5*
1978	11*			
1979	11			
1980	12			
1981	14			
1982	11			
1983[2]	17			
1996[3]	16	16	22	22

[1] Based on arithmetic averaging of data.
[2] Monitoring discontinued December 1983, reactivated March 1996 to April 1997.
[3] Arithmetic average – actual sampling ran from March 1996 to April 1997.
* Inadequate number of samples for a valid annual average.
Source: (McVehil-Monnett 1997)

Table 3-7. 2001 Through 2004 Annual Mean NO_2 Concentration Data.

Site Address	**2001 (µg/m³)**	**2002 (µg/m³)**	**2003 (µg/m³)**	**2004 (µg/m³)**
Thunder Basin National Grassland	6*	5	6	4
Campbell County	--	--	13	8
Tracy Ranch	--	--	--	8
Black Thunder Mine	5**	6	--	--
Belle Ayr Mine, Site Ba-4	14	14	13	13
Antelope Mine, Site 3	7	6	8	8

* Data for May through December 2001. Monitor was not operational until May 2, 2001.

** Data for the third quarter is questionable and therefore is not used in the determination of the annual mean for the site.

is approximately 24 miles south-southeast; the Belle Ayr Mine Site is approximately four miles northeast; and the Antelope Mine Site is approximately 33 miles south. These monitoring stations are maintained by WDEQ/AQD and respective mines. The WDEQ/AQD is relying on the on-going monitoring data and emission inventories in air quality permit applications to demonstrate compliance with the annual NO_2 ambient air standard (Table 3-3).

3.4.4 Visibility

Visibility refers to the clarity with which scenic vistas and landscape features are perceived at great distances. Visibility can be defined as the distance one can see and the ability to perceive color, contrast, and detail. Fine particulate matter ($PM_{2.5}$) is the main cause of visibility impairment. Visual range, one of several ways to express visibility, is the furthest distance a person can see a landscape feature. Without the effects of human-caused air pollution, a natural visual range is estimated to be about 140 miles in the western U.S. and 90 miles in the eastern U.S. (EPA 2001b).

Visibility impairment is expressed in terms of deciview (dv). The dv index was developed as a linear perceived visual change (Pitchford and Malm 1994), and is the unit of measure used in the EPA's Regional Haze Rule to achieve the National Visibility Goal. The National Visibility Goal was established as part of the CAA in order to prevent any future, and remedy any existing, impairment of visibility in mandatory Federal Class I areas that result from manmade air pollution. The deciview index is a scale related to visual perception that has a value near zero for a pristine atmosphere. A change in visibility of 1.0 dv represents a "just noticeable change" by an average person under most circumstances. Increasing dv values represent proportionately larger perceived visibility impairment.

3.4.4.1 Affected Environment for Visibility

AQRVs, including the potential air pollutant effects on visibility, are applied to PSD Class I and Class II areas. The land management agency responsible for the Class I area sets an LAC for each AQRV. The AQRVs reflect the land management agency's policy and are not legally enforceable standards. Table 3-4 shows the distances from 31 PSD Class I and Class II areas in the vicinity of the PRB to the Maysdorf LBA Tract general analysis area.

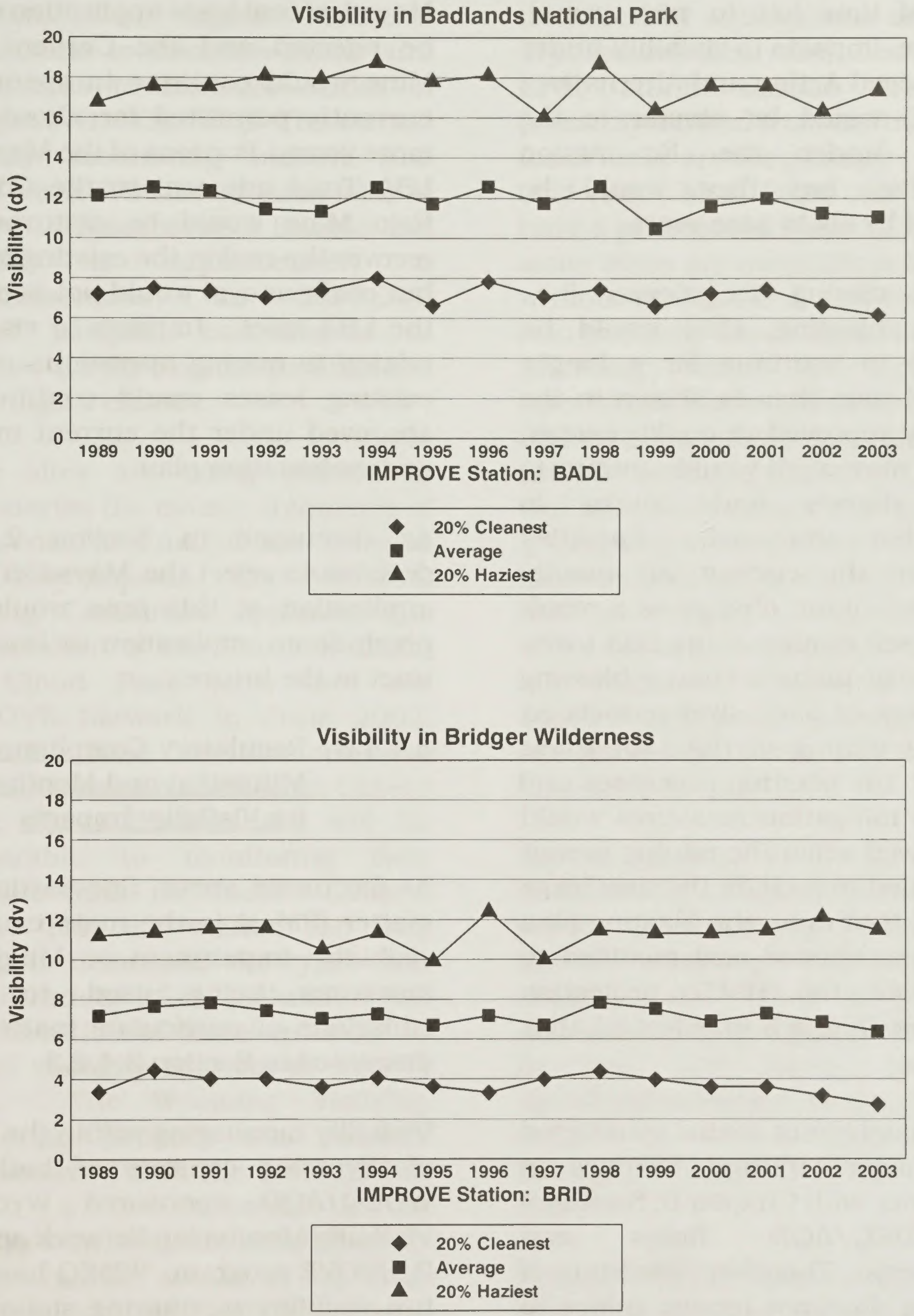
The Regional Haze Rule calls for improved visibility on the most-impaired days and no additional impairment on the least-impaired days. EPA participates in the IMPROVE visibility monitoring program as part of its visibility protection program. The IMPROVE monitoring sites were established to be representative of all Class I areas. Figure 3-9 shows annual averages for the 20 percent best, average, and worst visibility days at Badlands and Bridger Wilderness Areas from 1989 through 2003. To date, Badlands National Park has statistically shown improved visibility on the least impaired days and no change in visibility on the average and most-impaired days. Bridger Wilderness has shown no statistically significant change in visibility on the least, average, or most impaired days (IMPROVE 2005).

The *Wyoming State Implementation Plan for Class I Visibility Protection* states: "Wyoming's long term strategy will focus on the prevention of any future visibility impairment in Class I areas that can be attributed to a source or small group of sources as the Federal Land Managers have not identified any current impairment in the State's Class I areas due to such sources" (WDEQ/AQD 2005d). WDEQ/AQD prepared the *2003 Review Report on Wyoming's Long Term Strategy for Visibility Protection in Class I Areas*, as required by WAQSR, which calls for AQD to review and revise, if appropriate, the Long Term Strategy every three years. The 2003 Review Report is available on the WDEQ/AQD website at <http://deq.state.wy.us/aqd/visibility.asp>.

3.4.4.2 Environmental Consequences for Visibility

3.4.4.2.1 Proposed Action and Alternatives 2 and 3

The impacts to visibility from mining the Maysdorf LBA Tract have been inferred from the currently permitted impacts of mining the existing coal leases at the Cordero Rojo Mine. The Maysdorf LBA Tract would be mined as an integral part of the Cordero Rojo Mine. The average annual coal production is anticipated to remain at the projected post-2005 rate of 40 million tons, with or without the Maysdorf LBA Tract. Coal production is anticipated to increase to a maximum rate of 46 mmtpy, then taper off during the mine's later years, with or without the Maysdorf LBA Tract. Cordero Rojo Mine's currently approved air quality permit from the WDEQ/AQD allows up to 65 million tons of coal to be mined per year. If the mine acquires the



Source: IMPROVE(2005)

Figure 3-9. Visibility in the Badlands and Bridger Wilderness Area.

additional coal in the LBA tract, they would continue to produce at an average rate of 40 mmtpy for a longer period of time (six to nine years). Therefore, impacts to visibility under the Proposed Action and Alternatives 2 and 3 would be similar to the impacts under the No Action Alternative, but they would be extended by six to nine years.

Current mining techniques (i.e., haulage, blasting, etc.) would be expected to continue for a longer period of time than is shown in the currently approved air quality permit. Material movement would continue to utilize shovels and trucks in overburden and coal. Facilities shown in the current air quality permit would not change as a result of proposed mining of the LBA tract. There are no plans to change blasting procedures or blast sizes associated with the mining of the LBA tract; however, the blasting processes and required mitigation measures would be reviewed when the mining permit is amended to include the new lease area. At that time, the blasting plan would be reviewed and modified to incorporate the BACT protection measures that are in effect at that time.

Surface coal mines are not considered to be major emitting facilities in accordance with Chapter 6, Section 4 of WDEQ/AQD Rules and Regulations. Therefore, the State of Wyoming does not require mines to evaluate their impacts on Class I areas; however, BLM considers such issues during leasing.

3.4.4.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and the Cordero Rojo Mine would continue to operate as currently permitted for about nine more years. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases, but coal removal would not occur on the LBA tract. Impacts to visibility related to mining operations on the existing leases would continue as approved under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.4.4.3 Regulatory Compliance, Mitigation and Monitoring for Visibility Impacts

As discussed above, fine particulate matter ($PM_{2.5}$) is the main cause of visibility impairment. Mitigation measures being used to limit emissions of particulate matter are discussed in Section 3.4.2.3.

Visibility monitoring within the State of Wyoming consists of both the WDEQ/AQD sponsored Wyoming Visibility Monitoring Network and the IMPROVE program. WDEQ has sited two visibility monitoring stations in the PRB. One of these sites (the Thunder Basin National Grasslands site) is 32 miles north of Gillette and includes a nephelometer, a transmissometer, an IMPROVE aerosol sampler, instruments to measure meteorological parameters (temperature, RH, wind speed, wind direction), a digital camera, instruments to measure ozone and instruments to measure oxides of nitrogen (NO, NO_2, NO_x). The second visibility monitoring station (the Cloud Peak Wilderness Area site) is located 14 miles west of Buffalo and includes a nephelometer, a transmissometer, an IMPROVE aerosol sampler, instruments to measure meteorological parameters, and a digital camera.

These sites are being utilized to characterize the extent, frequency of occurrence, and magnitude of visual air quality impacts. The IMPROVE Steering Committee approved the incorporation of the Thunder Basin and Cloud Peak sites into the IMPROVE network in June 2002. Although these stations are not located in areas classified as Class I areas, the collected data will be comparable to monitoring data available from the state's Class I areas. This information can help scientists determine the types and concentrations of air pollutants and their direction of travel in order to project visibility impacts to Class I areas. The Wyoming Visibility Monitoring Network was recently supplemented with the development of a website at <http://www.wyvisnet.com/all.html> to allow public access to real-time monitored visibility and air quality conditions (WDEQ/AQD 2005a).

3.4.5 Acidification of Lakes

The acidification of lakes and streams is caused by atmospheric deposition of pollutants (acid rain). According to EPA, sulfur dioxide and NO_x, primarily derived from the burning of fossil fuels, are the primary causes of acid rain. Most lakes and streams have a pH between 6 and 8, although some lakes are naturally acidic even without the effects of acid rain. Acid rain primarily affects sensitive bodies of water, which are located in watersheds whose soils have a limited ability to neutralize acidic compounds (called "buffering capacity"). Lakes and streams become acidic (pH value goes down) when the water itself and its surrounding soil cannot buffer the acid rain enough to neutralize it. In areas where buffering capacity is low, acid rain also releases aluminum, which is highly toxic to many species of aquatic organisms, from soils into lakes and streams.

Several regions in the U.S. were identified in a national surface water survey as containing many of the surface waters sensitive to acidification. They include the Adirondacks and Catskill Mountains in New York State, the mid-Appalachian highlands along the east coast, the upper Midwest, and mountainous areas of the western U.S.

Scientists predict that the decrease in SO_2 emissions required by the Acid Rain Program will significantly reduce acidification due to atmospheric sulfur. Without the reductions in SO_2 emissions, the proportions of acidic aquatic ecosystems would remain high or dramatically worsen (EPA 2005c). The USDA-FS has been monitoring air quality in the Wind River Mountain Range in Wyoming since 1984 and is seeing a general trend of decreasing sulfates. Nitrates, on the other hand, have been increasing globally.

3.4.5.1 Affected Environment

AQRVs, including the potential air pollutant effects on the acidification of lakes and streams, are applied to PSD Class I and Class II areas. The land management agency responsible for the Class I area sets an LAC for each AQRV. The AQRVs reflect the land management agency's policy and are not legally enforceable standards.

Lake acidification is expressed as the change in ANC measured in microequivalents per liter (μeq/L), the lake's capacity to resist acidification from acid rain. Table 3-8 shows the existing ANC monitored in some mountain lakes and their distance from the Maysdorf LBA Tract general analysis area.

3.4.5.2 Environmental Consequences

3.4.5.2.1 Proposed Action and Alternatives 2 and 3

The Maysdorf LBA Tract would be mined as an integral part of the Cordero Rojo Mine; therefore, the impacts to air quality from mining the Maysdorf LBA Tract have been inferred from the impacts at the currently permitted mining operation. Cordero Rojo Mine anticipates that coal production would remain unchanged from projected post-2005 levels if the Maysdorf LBA Tract is acquired. Impacts to air quality related to lake acidification under the Proposed Action and Alternatives 2 and 3 would be similar to the impacts under the No Action Alternative, but they would be extended from six to nine years. Therefore, current mining techniques (i.e., haulage, blasting, etc.) would be expected to continue for a longer period of time than is shown in the currently approved air quality permit.

3.4.5.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and the Cordero Rojo Mine would continue to operate as currently permitted for about nine more years. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases, but coal removal would not occur on the LBA tract. Impacts to visibility related to mining operations on the existing leases would continue as approved under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.4.5.3 Regulatory Compliance, Mitigation, and Monitoring

Mitigation and monitoring for coal mine emissions, including the emissions that contribute to the acidification of lakes, are discussed in

Table 3-8. Existing Acid Neutralizing Capacity in Sensitive Lakes.

Wilderness Area	**Lake**	**Background ANC (µeq/L)**	**Distance from General Analysis Area (miles)**
Bridger	Black Joe	69.0	240
	Deep	61.0	230
	Hobbs	68.0	245
	Upper Frozen	5.8[1]	250
Cloud Peak	Emerald	55.3	105
	Florence	32.7	95
Fitzpatrick	Ross	61.4	240
Popo Agie	Lower Saddlebag	55.5	230

[1] The background ANC is based on only six samples taken between 1997 and 2001.

Source: Argonne (2002)

Sections 3.4.2.3 and 3.4.3.3. Other air quality monitoring programs that are in place in the PRB include WARMS monitoring of sulfur and nitrogen concentrations near Buffalo, Sheridan, and Newcastle, and NADP monitoring of precipitation chemistry in Newcastle.

3.4.6 Residual Impacts to Air Quality

No residual impacts to air quality would occur following mining and reclamation.

3.5 Water Resources

3.5.1 Groundwater

3.5.1.1 Affected Environment

The Maysdorf LBA Tract overlies three geologic water-bearing strata that have been directly affected by previous surface coal mining operations in the PRB and would be directly affected by mining the LBA tract. In descending order, these units are the recent alluvium, the Wasatch Formation overburden, and the mineable coal seam in the Tongue River Member of the Fort Union Formation, which is referred to as the Wyodak or Wyodak-Anderson by the Cordero Rojo Mine. The underlying, subcoal Fort Union Formation and the Fox Hills Sandstone are utilized for industrial water supply at the Cordero Rojo Mine and other nearby coal mines, but these units are not physically disturbed by mining activities. Both regional and site-specific baseline hydrogeologic environments within and around the Cordero Rojo Mine are extensively characterized in the WDEQ/LQD mining and reclamation permits (CMC 2004a and CRI 2002), which also provide groundwater monitoring data. Figure 3-2 presents the hydrostratigraphic units underlying the general analysis area.

3.5.1.1.1 Recent Alluvium

Within the Maysdorf LBA Tract, alluvial (unconsolidated, stream laid) deposits are primarily located in the Belle Fourche River valley and the lower portions of tributary draws where they join the river. The Belle Fourche River alluvium consists of recent stream channel deposits and terrace deposits. The thickness of alluvial deposits varies from absent where bedrock is exposed in the stream channel to more than 40 ft. Lesser quantities of alluvium occur in tributaries to the Belle Fourche. The alluvial, colluvial, and playa deposits associated with these dry tributary draws and other minor surface drainages within the LBA tract are generally thin and not laterally extensive enough to be considered aquifers. Saturated alluvium along the Belle Fourche varies from absent (dry from land surface to the top of the underlying overburden) to more than 10 ft thick, and is greatest near the stream channel.

Aquifer testing in the field and laboratory indicate that the Belle Fourche River alluvium has a very low hydraulic conductivity within the current Cordero Rojo Mine permit area, ranging from nearly zero to 2.83 ft/day.

Belle Fourche alluvial monitor well water level data indicate that alluvial groundwater flows down-valley, and exhibits a hydraulic gradient similar to that of the valley profile. Recharge to the alluvium is from direct precipitation, streamflow infiltration, and adjacent upland overburden areas. Channel bed materials are clayey and heavy-textured, which restricts recharge from or seepage to alluvial materials. Groundwater elevations and flow directions in the undisturbed portion of the Belle Fourche River alluvium within the southern portion of the Maysdorf LBA Tract have not been impacted by surface coal mining activities (i.e., Belle Fourche River diversion constructed in 1995) to date. The heavy-textured nature of the alluvial aquifer material severely limits groundwater flow down gradient.

In general, the groundwater in the saturated Belle Fourche River alluvium within the LBA tract is not suitable for domestic consumption or irrigation, and it is considered to be marginal for wildlife and livestock use. The alluvial water type is characterized as a sodium/calcium-sulfate with a TDS concentration averaging around 3,900 mg/L. The median TDS concentration for alluvial groundwater in the area of the Cordero Rojo Mine and the adjacent mines (Figure 1-1) is 3,314 mg/l, as calculated from 1,005 samples (Ogle et al. 2005). These numbers are similar but are not directly comparable; the average value is more likely to be influenced by a few high values. The Belle Fourche River alluvial groundwater quality characteristics are due partly to solute concentration by evapotranspiration, and partly to the relatively poor water quality that recharges the aquifer. The alluvial groundwater quality is similar to that of the Wasatch Formation. The low hydraulic conductivities and limited areal extent of saturation indicate that the alluvium does not exhibit aquifer characteristics adequate for agricultural or domestic use. There is currently no known use of alluvial groundwater in or near the Maysdorf LBA Tract general analysis area.

3.5.1.1.2 Wasatch Formation

Within the PRB, the Wasatch Formation (the strata lying above the coal seams or the overburden) generally consists of interbedded sands, silts, and clays with occasional discontinuous deposits of coal and carbonaceous material. This description basically holds true for the Maysdorf LBA Tract. The Wasatch strata range in cohesion from unconsolidated (i.e., loose sands and siltstones) to lithified (sandstones, siltstones, shales, and coal stringers). Any of the deposits may be water bearing, although the sands and sandstones possess a greater, but laterally limited, potential for groundwater yield. These sands and sandstones are generally discontinuous and separated laterally and vertically by the finer-grained siltstone and shale deposits. The discontinuous nature of the deposits produces considerable variability in groundwater elevations both laterally and vertically. The hydraulic connection between sandstone lenses is tenuous due to intervening shale aquitards; thus, groundwater movement through the Wasatch Formation overburden is limited. Because the water-bearing units within the Wasatch Formation are not continuous, the Wasatch is not considered to be a regional aquifer.

Another geologic unit that may be considered a part of the Wasatch Formation is scoria, also called clinker or burn. It consists of sediments that were baked, fused, and melted in place when the underlying coal burned spontaneously. These burned sediments collapsed into the void left by the burned coal. Scoria deposits can be a very permeable aquifer and can extend laterally for miles in the eastern PRB. The occurrence of scoria is site specific, typically occurring in areas where coal seams crop out at the surface. The hydrologic function of scoria is to provide infiltration of precipitation and recharge to laterally contiguous overburden and Wyodak coal beds. Scoria outcrop areas occur along the Cordero Rojo Mine's eastern permit boundary. No scoria deposits are present within the Maysdorf LBA Tract.

Recharge to the Wasatch Formation is from the infiltration of precipitation and lateral movement of water from adjacent scoria bodies. Regionally, groundwater is discharged from the Wasatch Formation by evaporation and transpiration, by pumping wells, by drainage into mine excavations, and by seepage into the alluvium along stream courses. Overburden in the vicinity of the LBA tract is recharged naturally by precipitation infiltration and infiltration of surface water runoff stored in playa areas. Additional, artificial recharge occurs where reservoirs have been constructed for ranching operations, and where CBNG groundwater is discharged to the surface.

For the Wasatch Formation as a whole in the PRB, the discontinuous nature of the water bearing units results in low overall hydraulic conductivity and low groundwater flow rates. Field aquifer tests within and adjacent to the Cordero Rojo Mine indicate that the water-bearing Wasatch strata typically have a low hydraulic conductivity, with a range of roughly two orders of magnitude (0.03 to 3.3 ft/day); with locally higher values being associated with higher sand fractions relative to the low-permeability silts and clays that make up the majority of the overburden. Aquifer testing has also verified that the overburden sands are typically isolated hydraulically from on another (CMC 2004a).

Premine saturated thicknesses in the overburden ranged from near zero in the eastern part of the Cordero Rojo Mine permit area to more than 200 ft in the western portions of the Maysdorf LBA Tract as applied for. Due to the discontinuous nature of the deposits, premine overburden groundwater movement generally followed the topography. Groundwater flow has since been affected in the mine area by the removal of overburden, and west and south of the mine by dewatering operations. Monitor well data indicate that overburden groundwater in the Maysdorf LBA Tract general analysis area now flows toward the mine; however, water levels in overburden monitoring wells located more than 500 ft from the pit have shown no significant decline and any changes have generally been only in response to seasonal fluctuations. Currently, overburden groundwater levels in the Cordero Rojo Mine area vary from approximately six to over 160 ft below land surface.

The quality of groundwater in the Wasatch Formation near the Maysdorf LBA Tract is extremely variable. TDS concentrations range from approximately 525 mg/L to 9,600 mg/L and the water type is characterized as a calcium/ magnesium-sulfate. The median TDS for the Wasatch Formation for the group of mines located between Gillette and Wright, as calculated by WDEQ/LQD based on 1,109 samples, is 2,996 mg/L (Ogle et al. 2005). The water is considered unsuitable for domestic consumption and irrigation, but suitable for livestock and wildlife use.

3.5.1.1.3 Wyodak Coal

The Tongue River Member of the Fort Union Formation contains the Wyodak coal seam, which is often divided by partings that separate it into two or more units. The separate units are given local names that vary from mine to mine (e.g., Upper and Lower Wyodak or Anderson and Canyon seams). At the Cordero Rojo Mine, it is referred to as either the Wyodak or the Wyodak-Anderson. Only local, discontinuous carbonaceous shale partings, typically less than one ft thick, occur in the Maysdorf LBA Tract general analysis area; therefore, the Wyodak coal seam is considered a single aquifer. A general description of the coal seam aquifer is presented as follows.

Due to its continuity, the Wyodak coal seam is considered a regional aquifer because it is water bearing and is laterally continuous throughout large areas in the PRB. Hydraulic conductivity within the Wyodak coal seam is highly variable and reflective of the amount of fracturing the coal has undergone, as unfractured coal is virtually impermeable. Field tests indicate that the coal has a low to moderate transmissivity with a range of roughly three orders of magnitude, with localized zones of moderately high transmissivity due to increased fracturing. The yield of groundwater to wells and mine pits is smallest where the permeability of the coal is derived primarily from localized unloading fractures. The highest permeability is imparted to the coal by tectonic fractures. Due to their pronounced surface expression, these tectonic fractures are often referred to as "lineaments". Coal permeability along lineaments can be increased by orders of magnitude over that in the coal fractured by unloading only. Such increased aquifer transmissivity occurs west of the Cordero Rojo Mine area, and is attributed to structural development that has produced additional fracturing. Hydraulic conductivity values reported for the Wyodak coal seam within the Cordero Rojo Mine permit boundary range from 0.03 to 19.0 ft/day, with a mean of approximately 4.0 ft/day (CMC 2004a and CRI 2002).

Recharge to the coal in the LBA tract occurs principally by infiltration of precipitation in the clinker outcrop areas along the Cordero Rojo Mine's eastern permit boundary. Secondary vertical recharge from the overburden also occurs. Prior to mining, the direction of groundwater flow within the coal aquifer was generally from recharge areas westward into the basin, following the dip of the coal. Groundwater conditions varied from unconfined to confined depending on the coal elevation and proximity to outcrop, and the coal was unsaturated in some portions of the Cordero Rojo Mine permit area.

Site-specific water-level data collected from monitoring wells by CMC and other Gillette area coal mining companies and presented in the GAGMO 20-year report (Hydro-Engineering 2001) indicate that the groundwater flow directions in the Wyodak coal have been greatly influenced by surface mine dewatering and groundwater discharge associated with CBNG development. Groundwater level declines observed near active mining areas prior to 1997 were due predominantly to mine dewatering alone and the direction of groundwater flow was toward the mine excavations. By year 2000, groundwater level decline rates had dramatically increased because drawdown caused by widespread CBNG development west of the mines was overlapping with drawdown caused by mining operations. The extent of drawdown west of the mines that is specifically attributable to mine dewatering can no longer be defined due to much greater drawdown in the coal caused by CBNG development (Hydro-Engineering 2001).

Coal groundwater commonly exceeds many suitability criteria for domestic uses and has a high salinity and sodium hazard, which makes it unsuitable for agricultural uses. Therefore, coal groundwater is typically only suitable for livestock and wildlife watering purposes. Within the general analysis area, Wyodak coal groundwater generally exhibits lower TDS concentrations than alluvial or overburden groundwater. The composition of groundwater in the coal is generally characterized as a calcium/ magnesium-sulfate type near the scoria outcrop recharge areas and transitions to a sodium-bicarbonate type as the groundwater moves downgradient. In the general analysis area, TDS concentrations range from around 600 mg/L to 4,400 mg/L, and average approximately 1,700 mg/L. WDEQ/LQD calculated a median TDS concentration of 920 mg/L for the coal aquifer in the area of the Cordero Rojo Mine and the adjacent mines (Figure 1-1), based on 1,200 samples (Ogle et al. 2005). The average and the mean values are calculated differently and are not directly comparable, with the average value more likely to be influenced by a few high values; however, these data suggest that the coal in the general analysis area has a higher TDS value than the coal in the surrounding area.

3.5.1.1.4 Subcoal Fort Union Formation

As discussed in Section 3.3.1.1, the Fort Union Formation is divided into three members: the Tongue River Member, the Lebo Member, and the Tullock Member. The mineable coal zones occur within the Tongue River Member. The subcoal Fort Union Formation consists primarily of lithified sands and shales, and is divided into three hydrogeologic units: the upper Tongue River aquifer, the Lebo confining layer, and the Tullock aquifer (Law 1976). Of the three units, the Tullock is the most prolific in terms of groundwater yield.

Mining does not directly disturb the hydrogeologic units below the mineable coal, but many PRB mines use them for industrial water supply wells. In a few cases there have been drawdowns in the subcoal aquifer due to leakage into mine pits, dewatering, and CBNG development (BLM 2001b).

Transmissivities are generally higher in the deeper Tullock aquifer than in the shallower Tongue River aquifer. Many mines in the PRB have water-supply wells completed in this interval (Martin et al. 1988), which is also utilized for municipal, industrial, and domestic water supply by the city of Gillette, residential subdivisions, and other nearby coal mines. The average transmissivity for the Tullock, as reported by OSM (1984), is 290 ft^2/day.

The water quality of the subcoal Fort Union Formation is generally suitable for domestic use and may be suitable for irrigation, depending upon TDS concentrations and site-specific SAR values. TDS concentrations measured in various subcoal Fort Union Formation water supply wells in the eastern PRB range from 230 mg/L to 520 mg/L.

According to SEO records, excluding wells for industrial and mining use, and based on depth of completion, there are 18 wells within three miles of the Maysdorf LBA Tract that are completed in the sub-coal Fort Union Formation: five for domestic and stock use and 13 for livestock-only use. CMC uses four wells completed in this formation (Rojo No. 1, Rojo No. 2A, PW-24-1-P, and PW-24-2-P) to supply water for human consumption and mining operations (Figure 3-10). The depths of these industrial water supply wells range from 988 to 2,034 ft.

3.5.1.1.5 Lance Formation-Fox Hills Sandstone

Underlying the Fort Union Formation is the Lance Formation of Cretaceous age. The Lance Formation is comprised of an upper confining layer and a lower aquifer. In Wyoming, the lower Lance Formation is also called the Fox Hills Sandstone. The Fox Hills Sandstone is described as a well-developed, fine- to medium-grained, marine sandstone that contains thin beds of sandy shale and averages around 670 ft thick.

Cordero Rojo Mine's industrial water supply well PW-23-1 (Figure 3-10) is completed in the Fox Hills Sandstone. This well is 4,130 ft deep and permitted to pump 375 gpm. According to chemical analyses, water from this well is potable, although it is used for dust suppression and other miscellaneous uses. If there is a need for additional potable water, it could be incorporated into the mine's potable water system.

3.5.1.2 Environmental Consequences

3.5.1.2.1 Proposed Action and Alternatives 2 and 3

Surface coal mining impacts the quantity of the groundwater resource in two ways: 1) the coal aquifer and any aquifers present in the overburden are removed from the mined areas during mining and replaced with unconsolidated backfill after the coal is removed, and 2) water levels in the coal and overburden aquifers adjacent to the mine pits are depressed as a result of seepage into and dewatering from the open excavations in the area of coal and overburden removal. If the Maysdorf LBA Tract is leased, the area of coal removal and reclamation would increase, which would result in an increase in the area of mining-related impacts to groundwater quantity. While there would be variations in hydrologic properties, the time the pits are open, the distance from mining and dewatering that has occurred as a result of previous mining and CBNG development, the area subject to lower water levels would be increased roughly in proportion to the increase in area affected by mining.

Currently approved mining will remove the existing Wasatch Formation overburden, Fort Union interburden (if present), and coal on the existing Cordero Rojo leases and replace these stratified units with backfill material composed of an unlayered mixture of the shale, siltstone, and sand that makes up the existing Wasatch Formation overburden and Fort Union Formation interburden (if present). The existing leases currently include approximately 13,269 acres. Mining the LBA tract as a maintenance lease would extend these impacts onto an additional area ranging from about 2,558 acres (Proposed Action) to about 4,025 acres (Alternatives 2 and 3).

If the Maysdorf LBA Tract is leased and mined under the Proposed Action

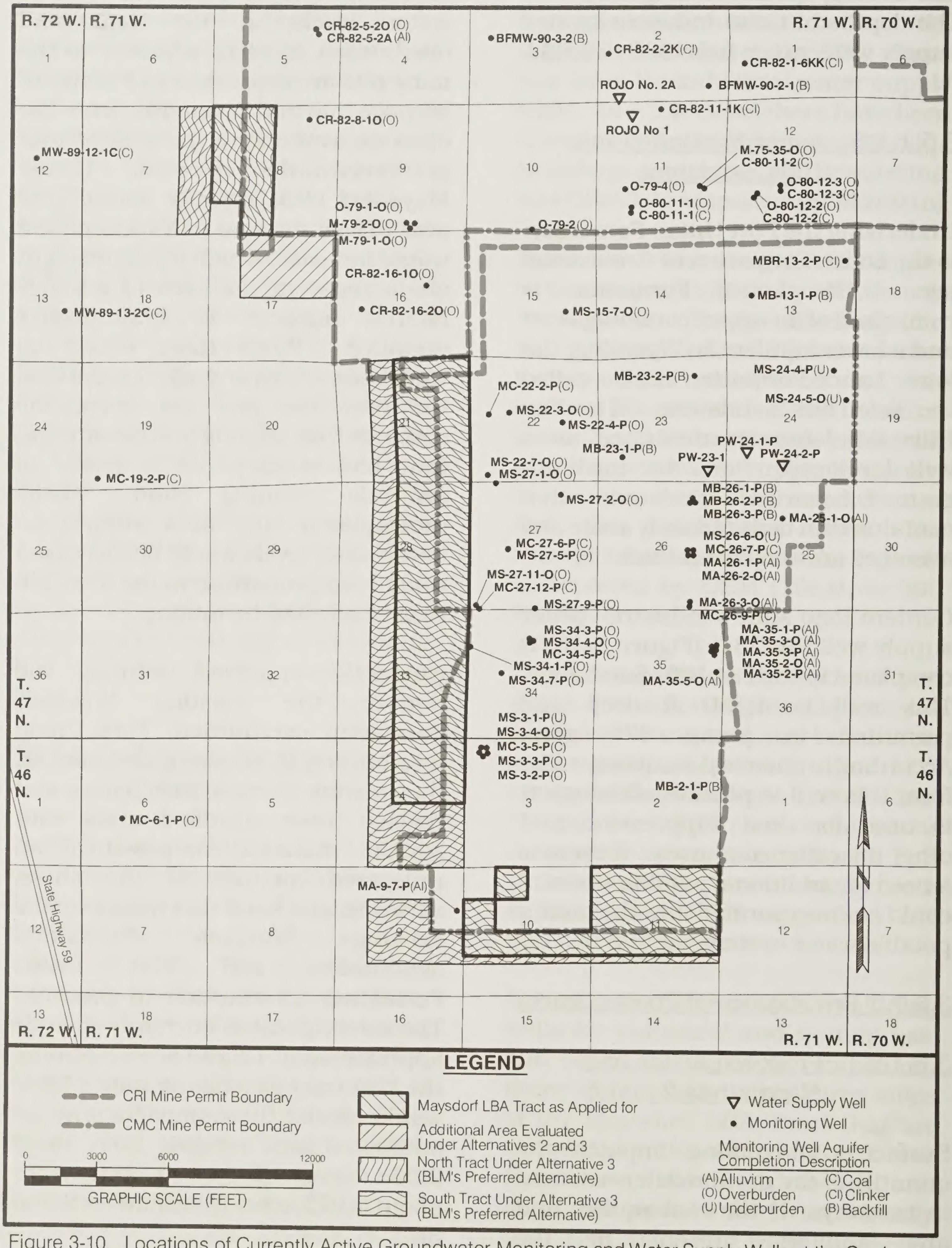

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
CR-82-5-2O (O)
CR-82-5-2A (Al)
BFMW-90-3-2(B)
CR-82-2-2K(Cl)
CR-82-1-6KK(Cl)
ROJO No. 2A
BFMW-90-2-1(B)
ROJO No 1
CR-82-11-1K(Cl)
CR-82-8-1O(O)
MW-89-12-1C(C)
M-75-35-O(O)
C-80-11-2(C)
O-79-4(O)
O-80-12-3(O)
C-80-12-3(C)
O-80-11-1(O)
C-80-11-1(C)
O-80-12-2(O)
C-80-12-2(C)
O-79-1-O(O)
M-79-2-O(O)
M-79-1-O(O)
O-79-2(O)
MBR-13-2-P(Cl)
CR-82-16-1O(O)
CR-82-16-2O(O)
MW-89-13-2C(C)
MS-15-7-O(O)
MB-13-1-P(B)
MB-23-2-P(B)
MS-24-4-P(U)
MC-22-2-P(C)
MS-24-5-O(U)
MS-22-3-O(O)
MS-22-4-P(O)
MB-23-1-P(B)
PW-24-1-P
PW-23-1
PW-24-2-P
MS-22-7-O(O)
MS-27-1-O(O)
MC-19-2-P(C)
MS-27-2-O(O)
MB-26-1-P(B)
MB-26-2-P(B)
MB-26-3-P(B)
MA-25-1-O(Al)
MS-26-6-O(U)
MC-27-6-P(C)
MS-27-5-P(O)
MC-26-7-P(C)
MA-26-1-P(Al)
MA-26-2-O(Al)
MS-27-11-O(O)
MC-27-12-P(C)
MS-27-9-P(O)
MA-26-3-O(Al)
MC-26-9-P(C)
MS-34-3-P(O)
MS-34-4-O(O)
MC-34-5-P(C)
MA-35-1-P(Al)
MA-35-3-O (Al)
MA-35-3-P(Al)
MA-35-2-O(Al)
MA-35-2-P(Al)
MS-34-1-P(O)
MS-34-7-P(O)
MA-35-5-O(Al)
T. 47 N.
T. 47 N.
T. 46 N.
T. 46 N.
MS-3-1-P(U)
MS-3-4-O(O)
MC-3-5-P(C)
MS-3-3-P(O)
MS-3-2-P(O)
MB-2-1-P(B)
MC-6-1-P(C)
State Highway 59
MA-9-7-P(Al)
R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
0
3000
6000
12000
GRAPHIC SCALE (FEET)
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
Water Supply Well
Monitoring Well
Monitoring Well Aquifer Completion Description
(Al) Alluvium
(O) Overburden
(U) Underburden
(C) Coal
(Cl) Clinker
(B) Backfill

Figure 3-10. Locations of Currently Active Groundwater Monitoring and Water Supply Wells at the Cordero Rojo Mine.

or Alternatives 2 or 3, the coal and overburden aquifers within the tract would be completely dewatered and removed and the area of drawdown caused by coal and overburden removal would be extended further to the west and south of the active mine area. The extent that drawdowns would propagate away from the mine pits would be a function of the water-bearing properties of the aquifer materials. In materials with high transmissivity and low storativity, drawdowns would extend further from the pit face than in materials with lower transmissivity and higher storage capacity.

In general, due to the geologic makeup of the Wasatch Formation overburden (discontinuous sandstone lenses in a matrix of siltstone and shale), drawdowns in the overburden do not extend great distances from the active mine pits. Due to the varied nature of the water-bearing units within the Wasatch Formation overburden, the extent of water level drawdowns are variable as well. Water levels in overburden monitoring wells located more than 500 ft from the Cordero Rojo Mine pits have shown no significant decline and, in fact, the water levels at nearly half of the mine's overburden monitoring wells are higher in elevation at present than in 1980. The maximum drawdown observed is approximately 90 ft at a single well located about 500 ft from an active pit. Drawdown at all of the other currently monitored overburden wells has been 22 ft or less (Hydro-Engineering 2004, CMC 2004b, and CRI 2004).

Water level drawdowns propagate much farther and in a more consistent manner in the Wyodak coal seam than in the overburden because of the regional continuity and higher transmissivity within the coal aquifer. Drawdowns in the coal seam are primarily a function of distance from the pit, although geologic and hydrologic barriers and boundaries such as crop lines, fracture zones, and recharge sources can also influence drawdowns. Drawdowns within the coal from 1980 to 1995 were generally in excess of five ft within 12 miles west and three miles south of the active pits at the Cordero Rojo Mine (Hydro-Engineering 1996). Prior to 1994, water level declines in most of the mine's coal monitoring wells were fairly gradual and mainly due to mine dewatering. However, in 1994, as a result of CBNG development, larger water level declines began to be observed in coal wells located roughly three miles or more west of the active pits than were observed in coal wells located within three miles of the active pits. Since 1995, coal monitoring wells located more than one mile west of the mine pits have recorded an increased rate of drawdown as a result of dewatering associated with CBNG production. By year 2000, the extent of drawdown to the west of the Cordero Rojo Mine caused by mine dewatering could not be defined due to the much larger drawdown caused by CBNG development (Hydro-Engineering 2001). In 2000, monitoring wells located within one mile west of the mine pits had recorded less than 100 ft of historical drawdown. However, monitoring wells located three or more miles west of the mine pits had recorded total drawdowns of 150 ft or more. Near State Highway 59, which was four to five miles west of the mine pits in 2000, approximately 180 ft of drawdown had occurred (Hydro-Engineering 2001). As of 2003, minimal additional drawdown had occurred immediately west of the advancing pits, although an additional 60 to 80 ft of drawdown had occurred in the vicinity of Highway 59 (Hydro-Engineering 2004). As of May 2005, dewatering by mining and CBNG development had lowered the Wyodak coal aquifer's groundwater level to around 40 ft above the base of the seam within the Maysdorf LBA Tract. The direction of groundwater flow within the LBA tract is now predominantly to the west rather than toward the Cordero Rojo Mine's open pits to the east. Groundwater level monitoring data are included in the annual progress report that the Cordero Rojo Mine submits to the WDEQ/LQD, as well as the GAGMO Annual Reports.

In 1992, CMC used the numerical groundwater flow model MODFLOW to predict the extent of cumulative water level drawdown in the Wyodak coal seam aquifer attributable to mining the existing leases at the Caballo, Belle Ayr, Caballo Rojo, Cordero, and Coal Creek Mines (WWC 1992). The results of the groundwater modeling are reported in Section 2.6, Addendum 2.6-10 of the Cordero Mine 237-T7 permit document (CMC 2004a). Overall, groundwater level monitoring data approximated the modeled impacts relatively well through the mid-1990s. However, both the rate and extent of the actual drawdown in the coal became much greater than the modeled drawdown in the late 1990s, effectively rendering the MODFLOW prediction obsolete. This has occurred as drawdown caused by extensive CBNG development west of the Cordero Rojo Mine permit area and the Maysdorf LBA Tract has overlapped with drawdown caused by mining operations.

The predicted extent of coal-mining related drawdown (five ft contour) in the Wyodak coal seam over the life of the Cordero Rojo Mine if the Maysdorf LBA Tract is mined is shown on Figure 3-11. The life-of-mine drawdown shown in this figure extends the predicted 1992 life-of-mine five ft drawdown contour westward by the dimensions of the Maysdorf LBA Tract. This extrapolation serves as a general approximation of the potential impacts, based on previous experience, but it does not take variations in hydrologic properties, the time the pits are open, the distance from mining and dewatering that has occurred as a result of previous mining and CBNG development into account. More precise predictions of the extent of drawdowns would be required in order to amend the Maysdorf LBA Tract into the WDEQ/LQD permit area, if the Cordero Rojo Mine acquires the Maysdorf LBA Tract.

A "no-coal" zone that exists in the southwest corner of the LBA tract, in Section 4, T.46N., R.71W., appears to be a paleochannel that is comprised of non-indurated sand (Section 3.3). This sand body will not be

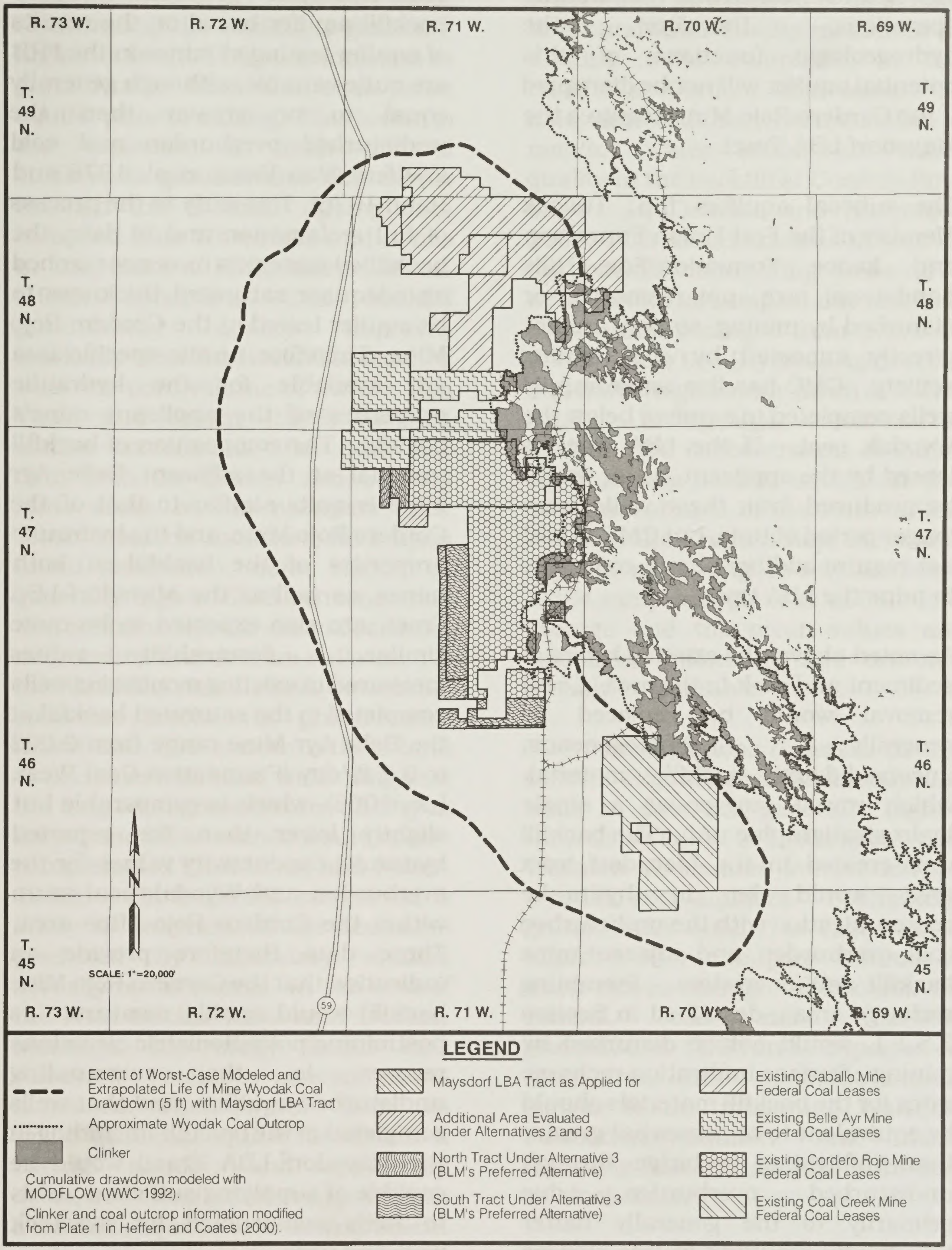

R. 73 W.
R. 72 W.
R. 71 W.
R. 70 W.
R. 69 W.
T. 49 N.
T. 48 N.
T. 47 N.
T. 46 N.
T. 45 N.
N
SCALE: 1"=20,000'
59
LEGEND
Extent of Worst-Case Modeled and Extrapolated Life of Mine Wyodak Coal Drawdown (5 ft) with Maysdorf LBA Tract
Approximate Wyodak Coal Outcrop
Clinker
Cumulative drawdown modeled with MODFLOW (WWC 1992).
Clinker and coal outcrop information modified from Plate 1 in Heffern and Coates (2000).
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
Existing Caballo Mine Federal Coal Leases
Existing Belle Ayr Mine Federal Coal Leases
Existing Cordero Rojo Mine Federal Coal Leases
Existing Coal Creek Mine Federal Coal Leases

Figure 3-11. Life of Mine Drawdown Map, Resulting from Currently Approved Mining With Addition of the Maysdorf LBA Tract.

significantly disturbed by mining operations; therefore, the hydrogeologic functions of this potential aquifer will not be disrupted if the Cordero Rojo Mine acquires the Maysdorf LBA Tract.

The subcoal aquifers (i.e., Tullock Member of the Fort Union Formation and Lance Formation-Fox Hills Sandstone) are not removed or disturbed by mining, so they are not directly impacted by coal mining activity. CMC has five water supply wells completed in aquifers below the Wyodak coal. If the LBA tract is leased by the applicant, water would be produced from these wells for a longer period of time, but CMC would not require additional sub-coal wells to mine the LBA tract.

As noted above, the existing layers of sediment and rock in the area of coal removal would be replaced by generally homogeneous, unconsolidated backfill material, which would recover as a single hydrostratigraphic unit. The backfill unit created in the Maysdorf tract area would be in hydraulic communication with the undisturbed coal, overburden, and adjacent mine backfill aquifer system. Premining recharge areas, described in Section 3.5.1.1, would not be disturbed by mining. Surface infiltration recharge rates for the backfill materials should be equivalent to or somewhat greater than infiltration recharge through undisturbed overburden, due primarily to the generally flatter topography resulting in less surface runoff.

The hydraulic properties of the backfill aquifer based on the results of aquifer testing at mines in the PRB are quite variable, although generally equal to or greater than the undisturbed overburden and coal aquifers (Van Voast et al. 1978 and Rahn 1976). It is early in the process of full reclamation and to date, the backfilled materials have not reached an adequate saturated thickness to be aquifer tested at the Cordero Rojo Mine. Therefore, no site-specific data are available for the hydraulic properties of the applicant mine's backfill. The composition of backfill material at the adjacent Belle Ayr Mine is quite similar to that of the Cordero Rojo Mine, and the hydraulic properties of the backfill at both mines, as well as the Maysdorf LBA Tract, are also expected to be quite similar. Permeability values measured in existing monitoring wells completed in the saturated backfill at the Belle Ayr Mine range from 0.002 to 0.8 ft/day (Foundation Coal West, Inc. 2003), which is comparable but slightly lower than the reported hydraulic conductivity values for the overburden and Wyodak coal seam within the Cordero Rojo Mine area. These data therefore provide an indication that the Cordero Rojo Mine backfill would readily resaturate as postmining potentiometric elevations recover in the surrounding undisturbed aquifers, and that wells completed in the backfill (including in the Maysdorf LBA Tract) would be capable of supplying sufficient yields to wells constructed for livestock watering uses.

Mining and reclamation also impacts groundwater quality; the TDS concentration in the water resaturating the backfill is generally higher than the TDS concentration in groundwater from the coal seam aquifer prior to mining. This is due to the exposure of fresh mineral surfaces to groundwater that moves through the backfill. Using data compiled from 10 surface coal mines in the eastern PRB, Martin et al. (1988) concluded that backfill groundwater quality improves markedly after the backfill is leached with one pore volume of water. Van Voast and Reiten (1988) reached similar conclusions after analyzing data from the Decker and Colstrip Mine areas in the northern PRB. Their research indicates that upon initial saturation, mine backfill is generally high in TDS concentration and contains soluble salts of calcium, magnesium and sodium sulfates. As the backfill is resaturated, the soluble salts are leached by groundwater inflow and TDS concentrations tend to decrease with time, indicating that the long term groundwater quality in mined and off-site lands would not be compromised (Van Voast and Reiten 1988). Clark (1995) conducted a study to determine if the decreases predicted by laboratory studies actually occur onsite. In the area of the West Decker Mine near Decker, Montana, his study found that dissolved solids concentrations increased when water from an upgradient coal aquifer flowed into a backfill aquifer, and apparently decreased along an inferred path from a backfill aquifer to a downgradient coal aquifer.

Groundwater quality within the backfill aquifer at the Maysdorf LBA Tract would be expected to be similar to groundwater quality measured in existing wells completed in the backfill at Cordero Rojo Mine. To date, nine wells have been installed to monitor water levels and water quality in the backfill at Cordero Rojo Mine. In October and November 2003, TDS concentrations in four of the backfill monitoring wells (five wells cannot be sampled due to a lack of saturation) ranged from 1,670 to 5,910 mg/L (Hydro-Engineering 2004) with a geometric mean of 4,210 mg/L. WDEQ/LQD calculated a median TDS concentration of 3,293 mg/L for the backfill aquifer in the east-central area of the PRB, which includes the Cordero Rojo Mine and adjacent mines (Figure 1-1), based on 1,384 samples (Ogle et al. 2005). The average and the mean values are calculated differently and are not directly comparable.

TDS concentrations observed in the Cordero Rojo Mine backfill monitoring wells to date are generally higher than those found in the undisturbed Wasatch Formation overburden or Wyodak coal aquifers. Postmining groundwater quality is expected to improve after one pore volume of water moves through the backfill. In general, the mine backfill groundwater TDS can be expected to range from 3,000 to 6,000 mg/L, similar to the premining Wasatch Formation aquifer, and meet Wyoming Class III standards for use as stock water.

Changes to the premining hydraulic characteristics of the alluvial aquifer and the quality of alluvial groundwater are expected to be minor after final reclamation, because Cordero Rojo Mine is required to maintain the essential hydrologic functions of the Belle Fourche River and its alluvial groundwater system. See additional discussion in Section 3.5.1.3.

As discussed in Chapter 2, the Proposed Action and Alternatives 2 and 3 assume that this LBA tract would be leased as a maintenance tract to an existing mine. As discussed above, there have been drawdowns in the coal and overlying aquifers as a result of the existing approved mining and the existing CBNG development in the vicinity of the LBA tract. In the Maysdorf LBA Tract, the level of groundwater in the Wyodak coal has already been lowered to around 40 ft above the base of the coal as a result of dewatering by existing mining and CBNG development activities in the area as of May 2005. The potential overlapping impacts of the existing mining activities with other proposed activities are discussed in Chapter 4.

3.5.1.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal would not occur on the Maysdorf LBA Tract. Impacts to groundwater resources related to existing approve mining and CBNG development, described above, would continue as permitted on the existing Cordero Rojo Mine leases. The surface and potentially some shallow aquifers in portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.5.1.3 Regulatory Compliance, Mitigation and Monitoring

In order to obtain a mining and reclamation permit, the Cordero Rojo Mine was required to evaluate regional and site-specific baseline hydrogeologic environments within and around the mine and use a groundwater flow model to predict the extent of cumulative water level drawdown in the Wyodak coal seam aquifer that would occur as a result of mining the existing leases at the Caballo, Belle Ayr, Caballo Rojo/Cordero, and Coal Creek Mines. Results of these studies are included in the WDEQ/LQD mine permits (CMC 2004a and CRI 2002). If the Maysdorf LBA Tract is leased and mined, the permit for the Cordero Rojo Mine will have to be amended to include the tract, and these studies will be revised accordingly.

As discussed in Section 3.5.3.3, SMCRA and Wyoming regulations, require mine operators to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water of equivalent quantity and quality.

The surface coal mines are also required to monitor water levels and water quality in the overburden, coal, interburden, underburden, and backfill. Groundwater monitoring wells installed by CMC within and around the current permit area have been used to evaluate groundwater conditions since 1974. Most monitor wells were installed between 1975 and 1982, and have since been used for long-term monitoring purposes until removed by mining operations or discontinued. Wells for which monitoring has been discontinued are still in place and may be reincorporated into the monitoring network in the future. Additional wells have been installed as mining has progressed, yielding a total of 221 wells that have historically been used for monitoring. Currently, 74 wells in and surrounding the mine permit area are monitored by CMC: 12 in the alluvium, 30 in the overburden, 15 in the coal, four in the clinker, four in the underburden, and nine in the mine backfill. The locations of these monitoring wells are shown on Figure 3-10.

Cordero Rojo Mine is required to maintain the essential hydrologic functions of the Belle Fourche River and its alluvial groundwater system that were identified prior to mining. In order to meet this requirement, the stream-laid alluvial materials would be salvaged and stockpiled during mining and would be replaced upon final reclamation (Section 3.5.1.3).

3.5.2 Surface Water

3.5.2.1 Affected Environment

The Belle Fourche River and its tributaries drain the existing Cordero Rojo Mine permit area and Maysdorf general analysis area. The Maysdorf LBA Tract and the existing mining operations and associated permit area are located primarily north of the Belle Fourche River. In this area, the narrow, shallow channel of the river meanders through a looping, one-half mile wide floodplain. A unique geomorphic feature of the Belle Fourche River in the general analysis area is a series of deep pools separated by shallow runs. Surface water features in the Maysdorf LBA Tract and the surrounding areas prior to all mining disturbance are displayed in Figure 3-12.

The Maysdorf LBA Tract consists predominantly of gently rolling topography, although the southern portion is dissected by the Belle Fourche River bottomlands and breaks. The Belle Fourche River flows roughly east-northeast through the southernmost portion of the tract and is currently diverted from its natural channel in this area to facilitate mining within the existing Cordero Rojo Mine permit area. The diversion channel was constructed in 1995. The diversion begins within the LBA tract area, near and parallel to the northern edge of Section 11, T.46N., R.71W., then extends to the north-northeast into the mine's existing permit area, across most of Section 2, T.46N., R.71W., where it rejoins the natural channel. Another channel diversion was constructed in 1977 in Sections 25 and 26, T.47N., R.71W as part of the mine's railroad spur and loop construction. Both of these diversions are shown in Figure 3-12.

Caballo and Coal Creeks, which are located north and southeast of the

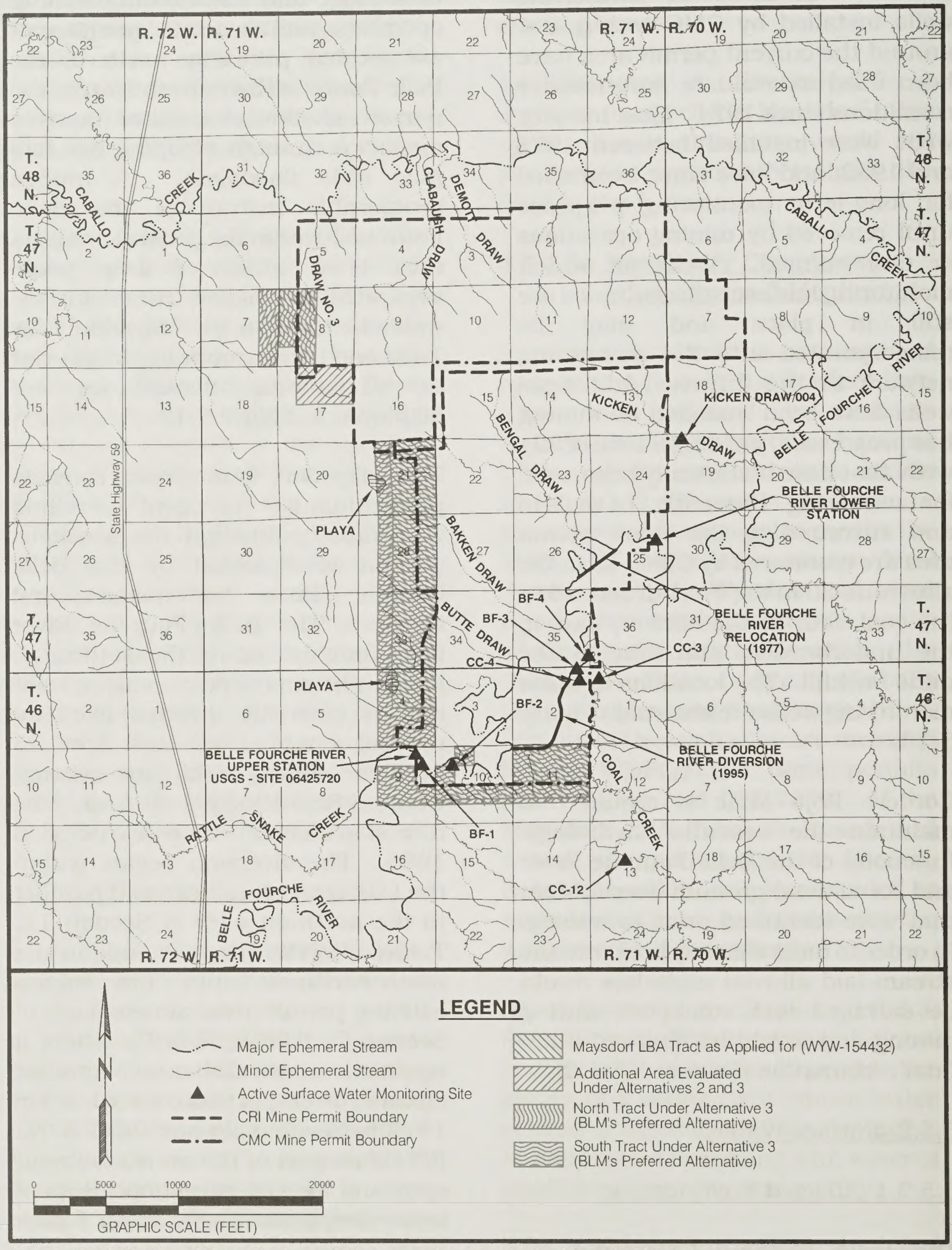

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
CABALLO CREEK
CLABAUGH DRAW
DEMOT DRAW
DRAW NO. 3
KICKEN DRAW
BENGAL DRAW
BAKKEN DRAW
BUTTE DRAW
BELLE FOURCHE RIVER
KICKEN DRAW/004
BELLE FOURCHE RIVER LOWER STATION
BELLE FOURCHE RIVER RELOCATION (1977)
BELLE FOURCHE RIVER DIVERSION (1995)
BELLE FOURCHE RIVER UPPER STATION USGS - SITE 06425720
PLAYA
PLAYA
BF-1
BF-2
BF-3
BF-4
CC-3
CC-4
CC-12
COAL CREEK
RATTLE SNAKE CREEK
State Highway 59
LEGEND
Major Ephemeral Stream
Minor Ephemeral Stream
Active Surface Water Monitoring Site
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Maysdorf LBA Tract as Applied for (WYW-154432)
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
N
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure 3-12. Surface Water Features Within and Adjacent to the Maysdorf LBA Tract.

tract, respectively, both discharge to the Belle Fourche River (Figure 3-12). Caballo Creek is located outside of the Cordero Rojo Mine permit area and the Maysdorf LBA Tract general analysis area. Coal Creek is located along the southeastern boundary of the mine permit area and a portion of it lies within the general analysis area (Figure 3-1). Caballo Creek flows easterly toward the Belle Fourche River about 1.5 miles north of the tract, and is currently diverted by the Belle Ayr Mine operation. Caballo Creek flows into the Belle Fourche River in Section 3, T.47N., R.70W. Coal Creek flows northwesterly toward the southern portion of the LBA tract and joins the Belle Fourche River near the end of the diversion channel in Section 2, T.46N., R.71W. The eastern edge of Section 11, T.46N., R.71W., in the southern portion of the LBA tract, coincides with the Coal Creek channel for about 1,000 ft. (Figure 3-12).

All streams, including the Belle Fourche River, within and adjacent to the tract are typical for the region in that flow events are ephemeral. Limited portions of the Belle Fourche River do receive recharge from bank storage (groundwater stored in the alluvium along the stream channel) making the stream locally intermittent.

The central and southern portions of the tract are drained by several shallow, first order tributaries of the Belle Fourche River, while the northern portion of the tract is drained by a few first order tributaries that flow north to Caballo Creek. Two areas on the tract do not drain toward any stream: a roughly 30-acre playa formed by a natural topographic depression exists in the northern portion of Section 4, T.46N., R.71W., and roughly a 40-acre playa formed by a natural topographic depression exists in the west-central portion of Section 21, T.47N., R.71W. (Figure 3-12).

Long-term streamflow records collected by the USGS on the Belle Fourche River near Moorcroft, Wyoming indicate an average discharge of about 16,700 ac-ft per year, ranging from 825 ac-ft in 1961 to about 98,300 ac-ft in 1978. Streamflow at USGS Station 06425720 (located in the NE¼NE¼ of Section 9, T.46N., R.71W., and depicted on Figure 3-12) was monitored continuously from 1975 to 1983, and then discontinued until 2001 when monitoring was reestablished. According to streamflow records from 1975 to 1983, the river at this gaging station did not flow throughout most of the year except in direct response to snow melt and precipitation runoff events. The annual mean streamflow during that period ranged from 0.19 to 9.82 cfs.

More recent streamflow records, from 2001 to the present, indicate that the mean annual streamflow of the Belle Fourche River at this location is normally less than five cfs, with greater, episodic flows occurring during heavy precipitation and snow-melt events. Streamflow occurrence is currently more persistent as a result of surface discharge of groundwater associated with CBNG production upstream of this monitoring station, which is a relatively recent phenomenon. In contrast to the infrequent nature of streamflow events that were recorded at Station 06425720 from 1975 to 1983, the Belle Fourche River at this location is now seldom completely dry. However, the mean annual streamflow rate and annual discharge volume have not significantly increased, indicating that pre-CBNG development conditions still prevail. Discharge volumes for 2002 and 2003 (the most recent period of record with a complete year's-worth of data) were 1,600 and 1,860 ac-ft, respectively.

The Belle Fourche River is listed in the WDEQ/WQD Surface Water Classification List as a Class 2AB stream that is protected for drinking water, aquatic life (classified as a warm water fishery), recreation, wildlife, agriculture, industry and scenic value. Coal Creek is listed as a Class 3B stream (not known to support fish populations or drinking water supplies and where those uses are not attainable). All other ephemeral streams draining the existing permit area and LBA general analysis area are categorized as Class 4 streams (where it has been determined that aquatic life uses are not attainable) (WDEQ/WQD 2005).

Springs are uncommon in the general analysis area and have not been identified in the Belle Fourche River valley. A few springs have been observed in upper terrace areas, but yield negligible flow that does not contribute directly to the Belle Fourche River.

Six reservoirs used for livestock water are located in the tract, all of which are in T.47N., R.71W. Two reservoirs are located on Draw No. 3, which drains north into Caballo Creek: one is in the SE¼SW¼ of Section 8, (0.41 acres), and the other is in the SE¼NW¼ of Section 8 (0.19 acres). One stock reservoir is located on Bengal Draw, which drains south into the Belle Fourche River, in the NW¼NE¼ of Section 21 (0.27 acres). Two stock reservoirs are located on Butte Draw, which drains south into the Belle Fourche River: one is in the NE¼NE¼ of Section 33 (0.25 acres), and the other in the SW¼SE¼ of Section 28 (0.14 acres). None of the existing reservoirs has estimated storage capacities of more than two acre-feet.

Water quality in the Belle Fourche River was measured by the USGS at Station 06425720 between November 1975 and April 1983, and from March 2001 to the present. In compliance with WDEQ/LQD permit monitoring requirements, CMC collects quarterly water quality samples from the Belle Fourche River at both the Upper and Lower Stations (Figure 3-12). Based on these historical water quality analyses, water from the Belle Fourche River is typically a sodium/calcium-sulfate type with TDS concentrations normally ranging around 2,000 to 3,000 mg/L. Surface water quality is usually unsuitable for domestic use, marginal for irrigation, and suitable for livestock and wildlife use. Total iron and manganese concentrations are significantly high in relation to domestic water use, although these metal concentrations coincide with increases in TSS concentrations.

Surface water quality typically varies with flow and/or season. In general, as streamflow increases, TDS concentration decreases, while TSS concentration increases. Conversely, as streamflow decreases, the TDS concentration increases, while the TSS concentration decreases. Due to the sparse vegetative cover and the infrequent occurrence of surface runoff in this semi-arid environment, high TSS concentrations can be expected, especially from floods caused by thunderstorms.

3.5.2.2 Environmental Consequences

3.5.2.2.1 Proposed Action and Alternatives 2 and 3

Changes in surface runoff characteristics and sediment discharges would occur during mining of the LBA tract as a result of the destruction and reconstruction of drainage channels as mining progresses and the use of sediment control structures to manage discharges of surface water from the mine permit area. Erosion rates could be high on the disturbed areas because of vegetation removal. However, both state and federal regulations require treatment of surface runoff from mined lands to meet effluent standards. Generally, the surface runoff sediment is deposited in ponds or other sediment control devices inside the permit area before the surface runoff water is allowed to leave the permit area.

Since the LBA tract would be mined as an extension of the existing mine under the Action Alternatives, there would not be a large increase in the size of the area that is disturbed and not reclaimed at any given time as a result of leasing the tract. The presence of disturbed areas creates a potential that sediment produced by large storms (i.e., greater than the 10-year, 24-hour storm) could potentially adversely impact areas downstream of the mining operation. This potential for adverse downstream impacts would be extended if the LBA tract were leased.

Following reclamation, the loss of soil structure would act to increase runoff rates on the LBA tract. However, the general decrease in average slope in reclaimed areas, as discussed in Section 3.2.2, would tend to counteract the potential for an increase in runoff. Soil structure would gradually reform over time, and vegetation (after successful reclamation) would provide erosion protection from raindrop impact, retard surface flows, and control runoff at approximately premining levels.

The Maysdorf LBA Tract may encounter significant runoff in the Belle Fourche River. A section of the river is currently diverted around active pits at the northern edge of the tract in Section 11, T.46N., R.71W. and within the existing Cordero Rojo Mine permit area. During mining of the LBA tract, hydrologic control would likely consist of building another diversion channel for the river around the open pit area. Due to its location in the headwaters area of ephemeral Belle Fourche River and Caballo Creek tributaries, runoff within the tract would not be expected to be substantial. In addition to diverting the Belle Fourche River, hydrologic control during mining would most likely consist of allowing runoff to accrue to the mine pit where it would be treated and discharged according to the standards of the WDEQ/WQD. Large flood control reservoirs are not anticipated for the LBA tract.

The impacts described above would be similar for both the Proposed Action and Alternatives 2 and 3, and they are similar to the expected impacts for the currently permitted mining operation.

3.5.2.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected; coal removal and the associated disturbance to the Belle Fourche River and its tributaries would not occur on the Maysdorf LBA Tract. The impacts to surface water resources described above would continue on the existing mine permit area as a result of currently approved mining and CBNG development. The surface in portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.5.2.3 Regulatory Compliance, Mitigation and Monitoring

In accordance with SMCRA and Wyoming State Statutes, the Belle Fourche River channel would be restored after surface mining operations are completed on the Maysdorf LBA Tract. Surface water flow, quality, and sediment discharge would approximate premining conditions. The drainages that intersect the permit area would be reclaimed to exhibit channel geometry characteristics similar to the premining characteristics. The Belle Fourche River would be restored in approximately the same location as the natural channel and its hydrologic functions, including the alluvial groundwater-surface water interaction and the premining pools and runs features would be restored.

Other WDEQ/LQD permit requirements for the existing Cordero Rojo Mine include constructing sediment control structures to manage discharges of surface water from the mine permit area; treatment of all surface runoff from mined lands as necessary to meet effluent standards; and restoration of stock ponds and playas disturbed during mining. These requirements would be extended to include the Maysdorf LBA Tract when the mine permit is amended to include the tract.

Monitoring requirements for the existing Cordero Rojo Mine include a monitoring program to assure that ponds would always have adequate space reserved for sediment accumulation and collection of water quality samples from the Belle

Fourche River at both the Upper and Lower Stations (Figure 3-12) on a quarterly basis. These requirements would be extended to include the Maysdorf LBA Tract when the mine permit is amended to include the tract.

3.5.3 Water Rights

3.5.3.1 Affected Environment

The Wyoming SEO administers water rights in Wyoming. Water rights are granted for both groundwater and surface water appropriations. Prior to development of water resources associated with energy development, water appropriations (either groundwater or surface water) in the PRB were typically for livestock use. Currently, mining companies and CBNG development companies hold the majority of the water rights in the general analysis area.

Records of the SEO have been searched for groundwater rights within a three-mile radius of the Maysdorf LBA Tract as applied for under the Proposed Action and Alternatives 2 and 3. This information is required for WDEQ permitting. The result of the most recent search is provided below. A more detailed listing of the non-coal mine related groundwater rights within a three-mile radius of the LBA tract is presented in the Draft EIS for the Maysdorf Coal Lease Application, which is available on request.

For the Maysdorf LBA Tract, SEO data indicate that, as of March 8, 2005, there are 2,702 permitted water wells within three miles of the tract, of which, 2,034 are owned by coal mining companies. The other 668 non-coal mine related, permitted water wells, which include 488 wells permitted for uses related to CBNG development, are permitted for the following uses:

- 278 CBNG only
- 122 livestock and CBNG
- 66 livestock only
- 36 miscellaneous and CBNG
- 29 domestic and livestock
- 21 industrial
- 21 miscellaneous
- 20 livestock, miscellaneous, and CBNG
- 16 domestic
- 16 miscellaneous, dewatering, and CBNG
- 15 miscellaneous, livestock, and CBNG
- 13 monitoring
- 3 industrial and miscellaneous
- 2 miscellaneous and livestock
- 2 livestock and miscellaneous
- 1 CBNG and livestock
- 1 dewatering, reservoir, and industrial
- 1 miscellaneous and domestic
- 1 livestock and industrial
- 1 livestock and irrigation
- 1 livestock, irrigation, and domestic
- 1 livestock, miscellaneous, and domestic
- 1 temporary, industrial, and drilling

SEO records have been searched for surface water rights within a three-mile radius of the Maysdorf LBA Tract as applied for and Alternatives 2 and 3. Like the groundwater rights, this information is also required for WDEQ permitting. The result of the most recent search is provided below. A listing of the non-coal mine related surface water rights is presented in the Draft EIS for the Maysdorf Coal Lease Application, which is available on request.

For the Maysdorf LBA Tract, SEO records indicate that as of March 8, 2005, there are 201 non-coal mine related, permitted surface water rights within the search area. These surface water rights are permitted for the following uses:

- 76 livestock
- 63 temporary industrial
- 22 irrigation
- 15 temporary industrial drilling
- 9 livestock and fisheries
- 8 temporary oil production and drilling
- 4 irrigation and domestic
- 3 temporary industrial miscellaneous
- 1 temporary oil production/drilling and miscellaneous

3.5.3.2 Environmental Consequences

3.5.3.2.1 Proposed Action and Alternatives 2 and 3

In March 2005, Wyoming SEO records indicate that there are a total of 2,702 permitted water wells presently located within three miles of the LBA tract. As discussed above, most of these wells are owned by coal mining companies and are used for groundwater monitoring and water supply. Of the non-coal mine related wells within the search area, approximately 32 percent are permitted for stock watering, 14 percent are permitted for miscellaneous use, 42 percent are permitted for CBNG development, four percent are permitted for industrial uses, and seven percent are permitted for domestic uses. Other uses amounted to approximately two percent. Most of these wells have been permitted for multiple uses.

Some of these privately permitted water wells will likely be impacted (either directly by removal of the well or indirectly by water level drawdown) by approved mining operations occurring at the Cordero Rojo and adjacent mines and additional water wells would be likely to be affected if the LBA tract is leased and mined. Three of the permitted water wells listed in Section 3.5.3.1 are located within the expanded five-ft drawdown contour with completion depths that indicate they produce water from the Wyodak coal seam (this excludes wells constructed for monitoring, mine dewatering, or CBNG production). These wells are shown on Table 3-9.

3.5.3.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal would not occur on the Maysdorf LBA Tract. The impacts to water rights associated with existing approved mining and CBNG development would continue to occur.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not

Table 3-9. Water Supply Wells Possibly Subject to Drawdown if the Maysdorf LBA Tract is Mined.

SEO Permit Number	**Applicant**	**Use**	**Yield (gpm)**	**Well Depth (ft)**	**Depth to Water (ft)**
P84138W	Austin Powder Co.	Miscellaneous	10	400	160
P45634W	Milo Haight	Stock	20	430	80
P73316W	Edna L. Carter	Domestic,	20	612	280

Note: Wells in this table are believed from their completion depths to be completed in the Wyodak coal seam and are within the additional area of five ft or more drawdown caused by mining the Maysdorf tract. Wells impacted by the No Action Alternative are already addressed in the Cordero Rojo Mine's WDEQ/LQD mine permit document.

preclude an application to lease the tract in the future.

3.5.3.3 Regulatory Compliance, Mitigation and Monitoring

SMCRA and Wyoming regulations require mine operators to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water of equivalent quantity and quality. This required mitigation is considered to be part of the Action Alternatives. The most probable source of replacement water would be one of the aquifers underlying the coal. For example, the subcoal Fort Union Formation aquifers are not removed or disturbed by coal mining, and would therefore be a potential source of replacement water.

If the Maysdorf LBA Tract is leased, the mine operator would be required to update the list of potentially impacted private water supply wells and predict impacts to those wells within the five-ft drawdown contour as part of the permitting process. The operator would be required to commit to replacing those water supplies that are determined to be affected by mining with water of equivalent quality and quantity.

3.5.4 Residual Impacts

The area of coal and overburden removal and replacement of overburden and associated groundwater drawdowns would be increased under the Action Alternatives compared with the area of coal and overburden removal and overburden replacement and associated groundwater drawdowns for the existing Cordero Rojo Mine. The postmining backfill may take in excess of 100 years to reach equilibrium water levels and water quality. Less time would be required near the mining boundaries. Monitoring data from wells completed in existing backfilled areas in the PRB suggest that there would be an adequate quantity of water in the backfill to replace current use, which is for livestock. Water quality in the backfill would generally be expected to meet the Wyoming Class III standards for use as stock water.

3.6 Alluvial Valley Floors

3.6.1 Affected Environment

Prior to leasing and mining, AVFs must be identified because, under SMCRA, mining on AVFs is prohibited unless the affected AVF is undeveloped rangeland that is not significant to farming or if the affected AVF is of such small acreage that it would have a negligible impact on a farm's agricultural production. These restrictions also apply to AVFs that are downstream of the area of disturbance but might be affected by disruptions in streamflow. AVFs that are determined not to be significant to agriculture can be disturbed during mining but must be restored as part of the reclamation process.

WDEQ regulations define AVFs as unconsolidated stream laid deposits where water availability is sufficient for subirrigation or flood irrigation agricultural activities. Guidelines established by OSM and WDEQ/LQD for the identification of AVFs require detailed studies of geomorphology, soils, hydrology, vegetation, and land use. These studies are used to identify the following conditions: 1) the presence of unconsolidated stream laid deposits, 2) the possibility for artificial flood irrigation, 3) past and/or present flood irrigation, and 4) apparent subirrigated areas and the possibility for natural flood irrigation. Areas that are identified as AVFs following these studies are evaluated for their significance to farming by WDEQ/LQD.

Portions of the Belle Fourche River and its associated ephemeral tributaries within the existing Cordero Rojo Mine permit boundary (including a portion of the Maysdorf LBA Tract) and portions of Caballo Creek within the existing Belle Ayr Mine permit boundary (north of the Maysdorf LBA Tract) have been investigated for the presence of AVF's (Foundation Coal West, Inc. 2003, CMC 2004a, and CRI 2002).

Three separate areas along Caballo Creek, located within and upstream of the existing Belle Ayr Mine permit boundary and north of the Maysdorf LBA Tract, have been determined by WDEQ/LQD to be AVFs. One of these was determined to be an AVF with possible significance to agriculture, while the other two were determined not to be significant to farming.

The reach of Belle Fourche River and its associated ephemeral tributaries within and adjacent to the existing Cordero Rojo Mine permit boundary have also been investigated for the presence of AVFs (CMC 2004a). WDEQ/LQD determined that the valleys of Kicken and Bengal Draws, Coal Creek, and Belle Fourche River in the vicinity of the Cordero Rojo Mine are not AVFs because they are not capable of supporting subirrigation or flood irrigation agricultural activities (WDEQ/LQD 2004a). The Belle Fourche River is considered an impractical water source for artificial flood irrigation practices due to poor water quality and infrequent water availability. Historic flood irrigation attempts have not been identified along the Belle Fourche or ephemeral drainages within the general analysis area.

CMC's baseline studies also determined that there is a small amount of groundwater in storage in the unconsolidated deposits of the Belle Fourche River, with subirrigation confined to a narrow area immediately adjacent to the channel (CMC 2004a).

The Maysdorf LBA Tract has not yet been formally evaluated for the presence of AVFs; however, CMC is currently conducting preliminary investigations along the Belle Fourche River and within its associated ephemeral draws to determine if AVFs are present within the southern portion of the LBA Tract. These studies include mapping of stream laid deposits, evaluations of groundwater availability and quality, assessment of subirrigated land, and evaluations of natural and flood irrigation.

A detailed AVF study would be part of the mine permitting process if the Maysdorf LBA Tract is leased. Formal declarations of the presence or absence of an AVF, its significance to agriculture, and the appropriate perimeter (areal extent) would be made by the WDEQ/LQD as part of the mine permitting process if the LBA tract is leased and proposed for mining.

3.6.2 Environmental Consequences

3.6.2.1 Proposed Action and Alternatives 2 and 3

AVF investigations conducted within and adjacent to the general analysis area have identified three small AVF areas that occur along Caballo Creek downstream of the northern portion of the Maysdorf LBA Tract. No AVFs have been identified along the Belle Fourche River and its associated ephemeral draws within and adjacent to the existing Cordero Rojo Mine permit boundary. As indicated above, the Maysdorf LBA Tract has not yet been formally evaluated for the presence of AVFs, but the general absence of flood irrigation activity in this area indicates it is unlikely that mining activity would be precluded by the presence of an AVF.

Streamflows in drainages within the Maysdorf LBA Tract would be diverted around the active mining areas in temporary diversion ditches or captured in flood control reservoirs above the pit. If flood control impoundments are used, it would be necessary to evacuate them following major runoff events to provide storage volume for the next flood. Consequently, disruptions to streamflows that might supply downstream AVFs are expected to be negligible. Groundwater intercepted by the mine pits would be routed through settling ponds to meet state and federal quality criteria, and the pond discharges would likely increase the frequency and amount of flow in these streams, thereby increasing surface water supplies to downstream AVFs.

If the LBA tract is mined as an extension of existing operations, the mining would extend upstream on streams already in active mine areas. Therefore, no direct, indirect, or cumulative impacts are anticipated to off-site AVFs through mining of the Maysdorf LBA Tract.

3.6.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal and associated impacts to any existing AVFs would not occur as a result of mining operations on the Maysdorf LBA Tract. The impacts to AVFs associated with mining operations at the Cordero Rojo and Belle Ayr Mines and CBNG development would continue to occur as approved under the current mining and reclamation permits.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.6.3 Regulatory Compliance, Mitigation and Monitoring

As discussed above, AVFs must be identified because SMCRA restricts mining activities that would affect AVFs that are determined to be significant to agriculture. Impacts are generally not permitted to AVFs that are determined to be significant to agriculture. AVFs that are determined not to be significant to agriculture or that were permitted to be disturbed prior to the effective date of SMCRA can be disturbed during mining but must be restored as part of the reclamation process. The determination of significance to agriculture is made by WDEQ/LQD, and it is based on specific calculations related to the production of crops or forage on the AVF and the size of the existing agricultural operations on the land of which the AVF is a part. For any designated AVF, regardless of its significance to agriculture, it must be demonstrated that the essential hydrologic functions of the valley will be protected. Downstream AVFs must also be protected during mining.

3.6.4 Residual Impacts

No residual impacts to AVFs would occur following mining.

3.7 Wetlands

3.7.1 Affected Environment

Waters of the U.S. is a collective term for all areas subject to regulation by the COE under Section 404 of the Clean Water Act. Waters of the U.S. include *special aquatic sites*, wetlands, and jurisdictional wetlands. Special aquatic sites are large or small geographic areas that possess special ecological characteristics of productivity, habitat, wildlife protection or other important and easily disrupted ecological values (40 CFR 230.3). Wetlands are a type of special aquatic site that includes "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" [33 CFR 328.3(a)(7)(b)].

There are effectively three categories of wetlands:

- Jurisdictional wetlands, which are defined as those wetlands which are within the extent of COE regulatory review. They must contain three components: hydric soils, a dominance of hydrophytic plants, and wetland hydrology.
- Non-jurisdictional wetlands, which are non-navigable, isolated intrastate wetlands (e.g., playas) and other Waters of the U.S. These wetlands are not considered to be jurisdictional as a result of a Supreme Court ruling (Solid Waste Agency of Northern Cook County *v.* United States Army Corps of Engineers, January 9, 2001). Navigable, non-isolated wetlands and other Waters of the U.S. are still considered jurisdictional by the COE.
- Functional wetlands, which are areas that contain only one of the three criteria listed under jurisdictional wetlands. The USFWS used this categorization in producing the NWI maps. These maps were produced using aerial photo interpretation, with limited field verification.

Several types of wetland systems are present within the general analysis area. These wetland systems are limited in size; however, the vegetation in these environments is highly productive and diverse, and provides habitat for many wildlife species. Further, the systems as a whole play important roles in controlling flood waters, recharging groundwater, and filtering pollutants (Niering 1985).

Wetlands occur in a variety of forms within the general analysis area. Palustrine wetlands, defined by their close association with emergent herbaceous marshes, swales, and wet meadows, support a variety of lush plant life and occur sporadically along drainages and closed depressions. These areas are supported by the saturated soils along the banks of the Belle Fourche River, discharged CBNG waters, and upland drainages that are adequately supplied with surface runoff.

Wetland inventories, based on USFWS NWI mapping and vegetation mapping in the field, were completed in 2005 by CMC on lands contained within a wetland analysis area. The area investigated is located within, west, and south of the current Cordero Rojo Mine permit area and includes the Maysdorf LBA Tract as applied for, the lands added under Alternatives 2 and 3, and a ¼mile disturbance buffer. Wetland areas previously mapped by the USFWS NWI project have been recently altered somewhat due to CBNG-related water production within and upstream of the general analysis area. Within the entire wetland analysis area (5,590.65 acres, of which 1,245.96 acres are within the current Cordero Rojo Mine permit area), a total of 154.2 acres of Waters of the U.S. have been identified. A total of 33.2 acres of jurisdictional Waters of the U.S. have been identified, of which approximately 30.0 acres are jurisdictional wetlands. Identified jurisdictional wetlands occur immediately along the banks of the Belle Fourche River channel and at intermittent locations in upland swale drainages adjacent to the river. The additional 3.2 acres of jurisdictional other Waters of the U.S., which did not qualify as jurisdictional wetlands, consist primarily as the open water of the Belle Fourche River. There are an additional 121.0 acres of non-jurisdictional Waters of the U.S. also contained in the wetland analysis area that include a large flooded playa, stockponds, depressions, and several ephemeral riverine systems that are isolated. Non-jurisdictional wetlands (78.4 acres) are associated with stockponds, depressions, and ephemeral riverine drainages that are isolated. The non-jurisdictional other Waters of the U.S. (42.6 acres) occur as an area of open water in Section 21, T.47N., R.71W., where water produced from nearby CBNG development wells is regularly discharged, resulting in year-round ponding in a depression/playa area.

3.7.2 Environmental Consequences

3.7.2.1 Proposed Action and Alternatives 2 and 3

Based on USFWS NWI mapping and vegetation mapping completed in 2005, a maximum of approximately 30 acres of jurisdictional and 78.4 acres of non-jurisdictional wetlands would be disturbed if the LBA tract is leased and subsequently mined under the largest tract configuration (Alternatives 2 and 3).

A formal wetland delineation has been confirmed by COE for some of the wetlands included in the proposed LBA tract (1,245.96 acres of the Cordero Rojo Mine's current permit area lie within the wetland analysis area), but wetland inventories covering portions of the LBA tract have not yet been submitted to COE for verification. This wetland inventory would be submitted to COE for verification as part of the mining and reclamation permit process. In Wyoming, once the delineation is verified by COE, it would be made a part of the mine permit document. The reclamation plan would then be revised to incorporate restoration of at least equal types and number of jurisdictional wetlands.

Non-jurisdictional wetlands would be restored as required by the federal surface managing agency, the WDEQ/LQD, or the private surface owner. These include stockponds, depressions, and ephemeral riverine drainages. The current WDEQ/LQD mine permit for the existing Cordero Rojo Mine requires restoration of stock ponds and playas disturbed during mining. Although playas may no longer be identified as jurisdictional Waters of the U.S. under Section 404 of the Clean Water Act as a result of court directives, the Cordero Rojo Mine plans to continue establishing playa/depression features within the reclaimed topography if the LBA tract is mined as an extension of existing operations.

During the period of time after mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not duplicate the exact function and landscape features of the premine wetlands, but replacement plans would be evaluated by COE and replacement would be in accordance with the requirements of Section 404 of the Clean Water Act as determined by COE.

3.7.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal would not occur on the Maysdorf LBA Tract. The impacts to wetlands on the existing Cordero Rojo Mine leases would occur as currently permitted. The surface of portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine, and any wetlands located on those lands, would be disturbed as currently permitted to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.7.3 Regulatory Compliance, Mitigation and Monitoring

The presence of jurisdictional wetlands on a mine property does not preclude mining. A wetland delineation must be completed according to approved procedures (COE 1987) and submitted to the COE for verification as to the amounts and types of jurisdictional wetlands present. There are special required permitting procedures to assure that after mining there will be no net loss of wetlands. COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act.

Section 404 of the Clean Water Act does not cover non-jurisdictional or functional wetlands; however, Executive Order 11990 requires that all federal agencies protect all wetlands. Replacement of non-jurisdictional and functional wetlands may be required by the surface land owner and/or WDEQ/LQD. WDEQ/LQD allows and sometimes requires mitigation of non-jurisdictional wetlands affected by mining, depending on the values associated with the wetland features. WDEQ/LQD also requires replacement of playas with hydrologic significance.

Reclaimed wetlands are monitored using the same procedures used to identify pre-mining jurisdictional wetlands.

3.7.4. Residual Impacts

Replaced wetlands (jurisdictional or functional) may not duplicate the exact function and landscape features of the premining wetland, but all wetland replacement plans would be approved by COE.

3.8 Soils

3.8.1 Affected Environment

Numerous baseline soil surveys associated with surface mining operations and oil field development have been conducted in the eastern PRB. Soil surveys of Campbell

County, Wyoming, including the Maysdorf LBA Tract soils analysis area, have also recently been conducted by the NRCS (Westerman and Prink 2004). The Maysdorf LBA soils analysis area (5,590.65 total acres) includes the BLM study area (the LBA tract as applied for under the Proposed Action and the additional area evaluated under Alternatives 2 and 3), as well as the additional area that would be disturbed in order to recover the coal in the study area (assumed to be a ¼ mile buffer surrounding the BLM study area).

Soils vary depending upon where and how they were formed. Major factors involved in the formation of soils include whether or not the material was transported and how the material was weathered during transportation. Four primary soil formation processes causing different soil types were noted in this area: 1) those soils developing predominantly in thin residuum from sandstone or shale on upland ridges, 2) those soils developing predominantly in slopewash, colluvium, or alluvial fan deposits from mixed sources on gently sloping uplands, 3) those soils developing predominantly in coarse-textured alluvium or sandy eolian deposits on rolling uplands, and 4) drainage soils developing in mixed stream laid alluvium on terraces and channels, and in fine-textured playa deposits in depressions and closed basins.

All soil surveys were completed to an Order 1-2 and 3 resolution in accordance with WDEQ/LQD Guideline No. 1, which outlines required soils information necessary for a coal mining operation. The inventories included field sampling and observations at the requisite number of individual sites, and laboratory analysis of representative collected samples. Soils within the analysis area were identified by series, which consist of soils that have similar horizons in their profile. More detailed information about the soils present on the Maysdorf LBA Tract is included in the supplementary information document for the Maysdorf EIS, which is available on request.

The soil depths and types on the Maysdorf LBA Tract soils analysis area are similar to soils currently being salvaged and utilized for reclamation at the adjacent Cordero Rojo Mine and other mines in the eastern PRB. The site-specific soil surveys have located hydric soils and/or inclusions of hydric soils, which are one component used in identifying wetlands. Areas with soils that are not suitable to support plant growth include sites with high alkalinity, salinity, or clay content.

3.8.2 Environmental Consequences

3.8.2.1 Proposed Action and Alternatives 2 and 3

Removal and replacement of soils during mining and reclamation would cause changes in the soil resources. In reclaimed areas, soil chemistry and soil nutrient distribution would generally be more uniform and average topsoil quality would be improved because soil material that is not suitable to support plant growth would not be salvaged for use in reclamation. This would result in more uniform vegetative productivity on the reclaimed land.

The Maysdorf LBA Tract baseline soils analysis indicates that the amount of suitable topsoil that would be available for redistribution on all disturbed acres within the soils analysis area during reclamation would have an average depth of 1.9 ft. The replaced topsoil would support a stable and productive vegetation community adequate in quality and quantity to support the planned postmining land uses (wildlife habitat and rangeland).

There would be an increase in the near-surface bulk density of the reclaimed soil resources on the LBA tract. As a result, the average soil infiltration rates would generally decrease, which would increase the potential for runoff and soil erosion. Topographic moderation following reclamation would potentially decrease runoff, which would tend to offset the effects of decreased soil infiltration capacity. The change in soil infiltration rates would not be permanent because revegetation and natural weathering action would form a new soil structure in the reclaimed soils, and infiltration rates would gradually return to premining levels. The reclaimed landscape would contain stable landforms and drainage systems that would support the postmining land uses. Reconstructed stream channels and floodplains would be designed and established to be erosionally stable.

Direct biological impacts to soil resources on the Maysdorf LBA Tract would include short-term to long-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts for soil resources that are stockpiled before placement.

Potential impacts to soil resources on the LBA tract after final reclamation under the Proposed Action or Alternatives 2 and 3 are quantified as follows. Under the currently approved mining and reclamation plan, approximately 14,694 acres of soil resources will be disturbed in order to mine the coal in the existing leases at the Cordero Rojo Mine (Table 3-1). If the Maysdorf LBA Tract is leased, disturbance related to coal mining would directly affect approximately 2,558.2 additional acres of soil resources on and adjacent to the LBA tract under the Proposed Action, or approximately 4,024.7 additional acres under Alternatives 2 and 3 (Table 3-1). Average topsoil thickness would be about 23 inches across the entire reclaimed surface. The types of soils and the quantities of the soil resource included in the Maysdorf LBA Tract under the Action Alternatives considered in this EIS are similar to the soils on the existing leases at the Cordero Rojo Mine. Additional information about the soil types on the LBA tract is included in the supplemental information document, which is available on request.

3.8.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal and the associated disturbance and impacts to soils would not occur on the 2,558.2 or 4,024.7 additional acres disturbed in the Proposed Action or Alternatives 2 and 3, respectively. Soil removal and replacement would occur on the existing Cordero Rojo Mine leases as currently permitted. Soils on portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.8.3 Regulatory Compliance, Mitigation and Monitoring

Soils suitable to support plant growth would be salvaged for use in reclamation. Soil stockpiles would be protected from disturbance and erosional influences. Soil material that is not suitable to support plant growth would not be salvaged. Soil or overburden materials containing potentially harmful chemical constituents (such as selenium) would be specially handled.

At least four ft of suitable overburden would be selectively placed on the graded backfill surface below the replaced topsoil to meet guidelines for vegetation root zones. After topsoil is replaced on reclaimed surfaces, revegetation would reduce wind erosion. The mine would construct sediment control structures as needed to trap eroded soil. Regraded overburden would be sampled for compliance with root zone criteria. Vegetation growth would be monitored on reclaimed areas to determine if soil amendments are needed.

3.8.4 Residual Impacts

Existing soils would be mixed and redistributed, and soil-forming processes would be disturbed by mining. This would result in long-term alteration of soil characteristics.

3.9 Vegetation

3.9.1 Affected Environment

The vegetation analysis area (5,590.65 total acres) includes the BLM study area (the LBA tract as applied for under the Proposed Action and the additional area evaluated under Alternatives 2 and 3) plus an additional area (assumed to be a ¼ mile buffer) that would be disturbed in order to recover the coal in the study area. The Maysdorf LBA Tract vegetation analysis area is partially located within and west and south of the current Cordero Rojo Mine permit boundary. Consequently, portions of the analysis area were previously mapped and sampled in accordance with the current WDEQ/LQD mine permitting requirements. The balance of the vegetation assessment was completed by ESCO Associates, Inc. of Boulder, Colorado in 2005. The vegetation communities in this area were appraised and mapped to provide a preliminary assessment.

The vegetation within the analysis area consists of species common to eastern Wyoming and consistent with vegetation that occurs within the adjacent Cordero Rojo Mine permit area. A total of eight vegetation types have been preliminarily identified and mapped within the Maysdorf LBA vegetation analysis area. Water and disturbed areas were also mapped. The vegetation types include sagebrush grassland, sandy grassland, rough breaks, playa, saline grassland, streamside bottomland, crested wheatgrass pasture, and salt pond.

The predominant vegetation types, in terms of total acres of occurrence in the vegetation analysis area are the sagebrush grassland (54.94 percent) and sandy grassland (32.40 percent), which occur primarily on the level uplands (Table 3-10). The sagebrush grassland vegetation type is characterized by Wyoming big sagebrush and upland grasses of the region. The sandy grassland vegetation type is dominated by needleandthread and upland sedges. Manyspine plains pricklypear cactus is frequently a large component of the vegetation cover. The ground-dwelling (but not ground-attached) lichen can make a substantial contribution to ground cover, particularly in dry years. The predominant vegetation types on approximately 12 percent of the vegetation analysis area include the rough breaks, saline grasslands, crested wheatgrass pasture, playa, salt pond, and streamside bottomland. On the rough breaks, the total vegetation cover is sparser than on the upland sagebrush grassland and sandy grassland, but the diversity of vascular plant species is greater. Common species may include most of those found in the more extensive upland types, but in addition, such species as bluebunch wheatgrass and Indian ricegrass are present. The saline grassland resembles sagebrush grassland with a generally sparser shrub presence

Table 3-10. Vegetation Types Identified and Mapped Within the Maysdorf LBA Tract Vegetation Analysis Area.

Vegetation Type	Acres	Percent of Area
Sagebrush Grassland	3,071.63	54.94
Sandy Grassland	1,811.31	32.40
Rough Breaks	282.43	5.05
Saline Grassland	124.52	2.23
Crested Wheatgrass Pasture	121.46	2.17
Playa	43.31	0.77
Water	42.59	0.76
Streamside Bottomland	36.64	0.66
Disturbed Area	34.35	0.61
Salt Pond	22.41	0.40
Total	**5,590.65**	**100.00**

Source: Nyenhuis 2005

and the common plant species are inland saltgrass, western wheatgrass, and blue gramma, while salt efflorescence is present on the soil surface. Western wheatgrass, bluegrass, foxtail barley, and alkali bluegrass occur near and around the playas. The streamside bottomland exists in the form of narrow bands that range from approximately two to 50 ft in width along the edges of the Belle Fourche River. The predominant plants are usually some combination of threesquare, common spikerush, broadleaf cattail, and bulrush. No trees are located within the general analysis area. Table 3-10 presents the acreage and percent of the analysis area encompassed by each vegetation type. Additional information about the vegetation types on the LBA Tract is included in the supplemental information document, which is available on request.

There are few occurrences of noxious weeds in the mine area; however, there are native areas adjacent to the mine permit area that are infested with noxious weeds, primarily Canada thistle (*Cirsium arvense*) along the Belle Fourche River.

3.9.2 Environmental Consequences

3.9.2.1 Proposed Action and Alternatives 2 and 3

Under the currently approved mining and reclamation plan, approximately 14,694 acres of vegetation will be disturbed in order to mine the coal in the existing leases at the Cordero Rojo Mine. Under the Proposed Action, mining of the Maysdorf LBA Tract would progressively remove the native vegetation on 2,558.2 additional acres on and near the LBA tract. Under Alternatives 2 and 3, mining of the LBA tract would progressively remove the native vegetation on 4,024.7 additional acres on and near the LBA tract. Vegetation removal on the LBA tract under the Proposed Action and Alternatives 2 and 3 is presented as the additional mine disturbance area in Table 3-1.

Short-term impacts associated with the removal of vegetation from the Maysdorf LBA Tract would include increased soil erosion and habitat loss for wildlife and livestock. Potential long-term impacts include loss of habitat or loss of habitat carrying capacity for some wildlife species as a result of reduced plant species diversity or reduced plant density for some species, particularly big sagebrush, on reclaimed lands. However, grassland-dependent wildlife species and livestock would benefit from the increased grass cover and production.

Reclamation, including revegetation of these lands, would occur contemporaneously with mining on adjacent lands, i.e., reclamation would begin once an area is mined. Estimates of the time elapsed from topsoil stripping through reseeding of any given area range from two to four years. This would be longer for areas occupied by stockpiles, haulroads, sediment-control structures, and other mine facilities. Some roads and facilities would not be reclaimed until the end of mining. No new life-of-mine facilities would be located on the LBA tract under the Proposed Action or Alternatives 2 and 3 because the LBA tract would be mined as an extension of an existing mine.

Grazing restrictions prior to mining and during reclamation would remove up to 100 percent of the LBA area from livestock grazing. This reduction in vegetative production would not seriously affect livestock production in the region, and long-term productivity on the reclaimed land would return to premining levels within several years following seeding with the approved final seed mixture. Use of the area by wildlife would not be substantially restricted throughout the operations.

In an effort to approximate premining conditions, the applicant would plan to reestablish vegetation types that are similar to the premine types during the reclamation operation. Reestablished vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved species are native to the LBA tract. Initially, the reclaimed lands would be primarily a mixture of prairie grasslands with graminoid/forb-dominated areas. An overall reduction in species diversity, especially for the shrub component, would occur. At least 20 percent of the native vegetation area would be reclaimed to native shrubs at a density of one per square meter as required by current regulations. Estimates for the time it would take to restore shrubs, including sagebrush, to premining density levels range from 20 to 100 years. As indicated previously, the predominant vegetation type on approximately 55 percent of the vegetation analysis area is sagebrush grassland and the reclamation standards call for restoration of sagebrush to at least 20 percent of the reclaimed area. Following completion of reclamation (seeding with the final seed mixture) and before release of the reclamation bond (a minimum of 10 years), a diverse, productive, and permanent vegetative cover would be established on the LBA tract. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, regardless of the alternative selected. The proposed postmining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. Native vegetation from surrounding areas would gradually invade and become established on the reclaimed land.

Following reclamation bond release, management of the privately owned surface areas would revert back to the private surface owners, who would have the right to manipulate the reclaimed vegetation.

A reduction in sagebrush would result in a long term reduction of habitat for some wildlife species and may delay use of the reclaimed area by shrub-dependent species, such as the sage grouse. An indirect impact of this vegetative change could be decreased big game habitat carrying capacity.

On average, roughly 400 to 500 acres of surface would be disturbed per year of mining if the proposed lease area is mined, regardless of which alternative is selected. By the time mining ceases, over 75 percent of these disturbed lands would have been reseeded. The remaining 25 percent would be reseeded during the following two to three years as the life-of-mine facilities area is reclaimed.

The reclamation plan for the existing Cordero Rojo Mine includes steps to control invasion by weedy (invasive nonnative) plant species because WDEQ/LQD rules and regulations require surface coal mine operators to control and minimize the introduction of noxious weeds in accordance with Federal and State requirements until bond release (SOSWY 2007). As a result, there are few occurrences of noxious weeds in the mine area. The reclamation plan for the Maysdorf LBA Tract would also include steps to control invasion from such species.

The climatic record of the western U.S. suggests that droughts could occur periodically during the life of the mine. Such droughts would severely hamper revegetation efforts, since lack of sufficient moisture would reduce germination and could damage newly established plants. Same-aged vegetation would be more susceptible to disease than would plants of various ages. Severe thunderstorms could also adversely affect newly seeded areas. Once a stable vegetative cover is established, however, these events would have similar impacts as would occur on native vegetation.

Changes expected in the surface water network on the LBA tract as a result of mining and reclamation would affect the reestablishment of vegetation patterns on the reclaimed areas to some extent. The postmining maximum overland slope would be 20 percent, in accordance with WDEQ policy. The average reclaimed overland slope on the LBA tract would not be known until WDEQ's technical review of the permit revision application is complete. No major changes in the average overland slope are predicted.

There would be no net loss of jurisdictional wetlands. They would be restored under the jurisdiction of the COE (Section 3.7). Functional wetlands would be restored in accordance with the requirements of the federal surface managing agency, WDEQ/LQD, or the private surface owner.

3.9.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal and the associated disturbance and impacts to vegetation would not occur on the 2,558.2 or 4,024.7 additional acres disturbed in the Proposed Action or Alternatives 2 and 3, respectively. Coal removal and the associated removal and replacement of vegetation would occur on the existing Cordero Rojo Mine leases as currently permitted. Vegetation on portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.9.3 Threatened, Endangered, Proposed, and Candidate Plant Species, and BLM Sensitive Species

Refer to Appendices E and F.

3.9.4 Regulatory Compliance, Mitigation and Monitoring

Reclaimed areas would be revegetated as specified in the approved mine plan using reclamation seed mixtures which would be approved by WDEQ. The majority of the species would be native to the LBA tract. At least 20 percent of the native vegetation area would be reclaimed to native shrubs at a density of one per square meter as required by current regulations. Shrubs would be selectively planted in riparian areas.

The Cordero Rojo Mine mining and reclamation permit includes a requirement to control weeds in reclaimed areas by means of agriculturally accepted techniques. Occurrences of noxious weeds are identified by CMC staff, ranchers grazing cattle on the reclaimed areas, contractors who conduct vegetation monitoring, and contractors who conduct weed spraying in the mine permit area. Weed control measures include limited grazing, mowing, burning, chemical control, and other management practices, when approved by WDEQ/LQD. A contractor is hired annually to spray noxious weeds that are identified in reclaimed areas; adjacent native areas that are infested with noxious weeds are also sprayed. In order to reduce the likelihood of occurrence of noxious weeds, CMC buys "blue tag certified" seed mixes for reclamation areas. Similar steps to control invasion by weedy (invasive nonnative) plant species using chemical and mechanical methods would be included in the amended mine plan, if the Maysdorf LBA Tract is leased.

Detailed wetland mitigation plans would be developed and approved by COE during the permitting stage to ensure no net loss of jurisdictional wetlands occurs within the total disturbance area (Section 3.7). Non-jurisdictional and functional wetlands would be restored in accordance with the requirements of the surface managing agency, surface landowner, or as required by WDEQ/LQD.

Revegetation growth and diversity would be monitored until the final reclamation bond is released (a minimum of 10 years following seeding with the final seed mixture). Erosion would be monitored to determine if there is a need for corrective action during establishment of vegetation. Controlled grazing would be used during revegetation to determine the suitability of the reclaimed land for post-mining land uses.

3.9.5 Residual Impacts

Reclaimed vegetative communities may never completely match the surrounding native plant community.

3.10 Wildlife

3.10.1 General Setting

This section discusses the affected environment and environmental consequences to wildlife in general. The subsequent sections address the potential impacts to specific groups of wildlife species.

3.10.1.1 Affected Environment

Background information on wildlife in the vicinity of the Maysdorf LBA Tract was drawn from several sources, including the South Powder River Basin Coal FEIS (BLM 2003a), WGFD and USFWS records, and personal contacts with WGFD and USFWS biologists. Site-specific data for the Maysdorf LBA Tract general analysis area were obtained from several sources, including WDEQ/LQD mine permit applications and annual wildlife monitoring reports for the applicant and nearby coal mines. CMC initiated baseline investigations in 2005 expressly for the Maysdorf LBA Tract, and the proposed lease area has received comprehensive coverage during baseline and annual wildlife monitoring surveys for the adjacent Cordero Rojo Mine since the mid-1970s. Baseline and annual wildlife surveys cover a large perimeter around mine permit areas; consequently, a majority of the proposed lease area has been surveyed as part of the required monitoring surveys for both the Cordero Rojo and Belle Ayr Mines. Site-specific surveys for the entire leased area and appropriate perimeter would be part of the mine permitting process if the tract is leased.

The topography within the general analysis area is mainly gently rolling and of moderate relief, influenced by the Belle Fourche River. Elevation ranges from approximately 4,510 to 4,770 ft above sea level. Rough breaks and streamside bottomland areas occur near the Belle Fourche River, which flows through the southern portion of the tract (Figure 3-12).

In an undisturbed condition, the major vegetation types in the general analysis area (discussed in Section 3.9) provide high quality habitats for many species. Vegetation types tend to occur in a mosaic across the landscape; therefore, many wildlife species can be expected to utilize more than one habitat type. Wildlife habitat types include sagebrush grassland, sandy grassland, seeded grassland, bottomland grassland, and rough breaks. Various, relatively small parcels of crested wheatgrass pasture occur throughout the area. As a result of oil and gas development in this area, there are networks of road and well-pad disturbance areas overlaying much of the sagebrush-grassland and sandy-grassland areas, as well as tank batteries and miles of pipeline disturbance with varying degrees of recovering vegetative cover. No designated critical, crucial, or unique habitats are present.

The predominant habitat is sagebrush grassland and sandy grassland is the next largest habitat type (Table 3-10). Seeded grassland is dominated by crested wheatgrass, but older seedings have a mixture of less dominant native plant species and, with the passage of time, these seedings begin to resemble sagebrush grassland again. Bottomland grassland or streamside bottomland habitat is limited to a narrow band along the edges of the Belle Fourche River in the southern portion of the general analysis area. No trees are present along the river or any of its tributaries in the general analysis area. Rough breaks habitat is distinguished by the irregularity of vegetation, slopes, and soils. Vegetation on the rough breaks is typically sparse, although the diversity of vascular plant species is greater than in the sagebrush grassland and sandy grassland communities.

Under natural conditions, all streams, including the Belle Fourche River, within and adjacent to the LBA tract are ephemeral. In response to surface discharge of groundwater associated with CBNG production upstream of the LBA tract, which is a relatively recent phenomenon, streamflow occurrence is now more persistent. The Belle Fourche River and the distinctive shallow pools that are present along its natural course in the general analysis area are now seldom completely dry, resulting in an increase in habitat for waterfowl, shorebirds, and aquatic species. Six small stock reservoirs and two playa areas exist in the general analysis area (Section 3.5.2.1). One of the playas has been turned into a temporary shallow pond as the result of a CBNG well discharging within its drainage area.

Cordero Rojo Mine's approved WDEQ/LQD mine permit allows disturbance of the Belle Fourche River channel. Approximately six miles of the natural channel has been diverted to-date within the Cordero Rojo Mine's current permit area. CMC would propose another diversion of the Belle Fourche River if they acquire a lease for the Maysdorf LBA Tract.

3.10.1.2 Environmental Consequences

3.10.1.2.1 Proposed Action and Alternatives 2 and 3

If the Maysdorf LBA Tract were leased under the Proposed Action or Alternatives 2 and 3, coal removal and associated mining disturbance would extend onto the LBA tract. Mining would be extended by up to nine years at the Cordero Rojo Mine. Impacts to wildlife that would be caused by mining the LBA tract would be addressed by the WGFD and the WDEQ/LQD when the mining and reclamation permit is amended to include the LBA tract.

Mining directly and indirectly impacts local wildlife populations. These impacts are both short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles, and pits, and displacement of wildlife from active mining areas. Displaced animals may find equally suitable habitat that is not occupied by other animals, occupy suitable habitat that is already being used by other individuals, or occupy poorer quality habitat than that from which they were displaced. In the second and third situations, the animals may suffer from increased competition with other animals and are less likely to survive and reproduce. If the Maysdorf LBA Tract is leased and mined, the direct impacts related to mine traffic and mine operations would be extended within the general analysis area by up to nine years.

The indirect impacts are longer term. After the LBA tract is leased, mined, and reclaimed, alterations in the topography and vegetative cover, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity for some species and a decrease in vegetative diversity. Sagebrush would gradually become reestablished on the reclaimed land, but the topographic changes would be permanent. Microhabitats may be reduced on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

3.10.1.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and the impacts to wildlife and wildlife habitat associated with coal removal described above would not occur on the Maysdorf LBA Tract, but would continue to occur on the existing Cordero Rojo Mine coal leases as currently permitted. Coal removal would not affect wildlife habitat on from 2,558.2 or 4,024.7 additional acres (under the Proposed Action or Alternatives 2 and 3, respectively); however, wildlife habitat on portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.10.2 Big Game

3.10.2.1 Affected Environment

The two big game species that are common in suitable habitat throughout the general analysis area are pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*). White-tailed deer (*Odocoileus virginianus*) and elk (*Cervus elaphus*) are transients east of the Maysdorf LBA Tract. No crucial big game habitat or migration corridors are recognized by the WGFD in this area.

Pronghorn are by far the most common big game species in this area. This species is most abundant in the sagebrush grassland or mixed-grass prairie habitats. Reclaimed grassland constitutes only a small portion of the available habitat around the PRB mines, although pronghorn are observed during all seasonal surveys in these areas. Home range for pronghorn can vary between 400 acres to 5,600 acres, according to several factors including season, habitat quality, population characteristics, and local livestock occurrence. Typically, daily movement does not exceed six miles.

Pronghorn may make seasonal migrations between summer and winter habitats, but migrations are often triggered by availability of succulent plants and not local weather conditions (Fitzgerald et al. 1994). The WGFD has classified the general analysis area as primarily winter/yearlong pronghorn range, which means that a population or a portion of a population of animals makes general use of this habitat on a year-round basis and that there is a significant influx of additional animals onto this habitat from other seasonal ranges in the winter. The entire general analysis area is within the WGFD Hilight Herd Unit. In post-season 2004, the WGFD estimated the Hilight Herd Unit to be 11,416 animals, with an objective of 11,000 (WGFD 2004).

Mule deer use nearly all habitats, but prefer sagebrush grassland, rough breaks, and riparian bottomland. Browse is an important component of the mule deer's diet throughout the year, comprising as much as 60 percent of total intake during autumn, while forbs and grasses typically make up the rest of their diet (Fitzgerald et al. 1994). Mule deer are frequently observed on Cordero Rojo Mine reclaimed lands. In certain areas of the state this species tends to be more migratory than white-tailed deer, traveling from higher elevations in the summer to winter ranges that provide more food and cover. However, monitoring has indicated that mule deer are not very migratory in the vicinity of the Maysdorf LBA Tract. The WGFD has classified a majority of the general analysis area as being out of normal mule deer use range and a small portion as being yearlong mule deer use range, which means that a population or substantial portion of a population of animals makes general use of this habitat on a year-round basis, but may leave the area under severe conditions on occasion. The entire area is located within the WGFD Thunder Basin Mule Deer Herd Unit. No crucial or critical mule deer ranges or migration corridors occur on or within several miles of the Maysdorf LBA Tract or in the general analysis area. Crucial range is defined as any particular seasonal range or habitat component that has been documented as the determining factor in a population's ability to maintain and reproduce itself at a certain level. The WGFD estimated the 2004 post-season mule deer for the herd unit at 19,299, which is near the current objective of 20,000 (WGFD 2004).

White-tailed deer are generally managed separately by the WGFD in the Central Herd Unit. White-tailed deer prefer riparian habitats and are therefore seldom observed in the general analysis area due to the lack of that particular habitat. The WGFD classifies the entire general analysis area as out of the normal white-tailed deer use range. A narrow corridor along the Belle Fourche River east of the Maysdorf LBA Tract and east of the Cordero Rojo Mine area is classified as yearlong range. White-tailed deer are occasionally recorded along the Belle Fourche River and Pine Hills to the east but have rarely been recorded in the general analysis area.

Elk reside in the Rochelle Hills south of the general analysis area. Elk do wander from the protection of the Rochelle Hills to forage in native and reclaimed grasslands within the general analysis area. None of the general analysis area is classified by the WGFD as within normal elk use range. As more lands are reclaimed from mining, elk are shifting their winter use to these areas. The WGFD has designated an approximately five square mile area on reclaimed lands within the Jacobs Ranch Mine permit area as crucial winter habitat for the Rochelle Hills elk herd (Odekoven 1994). The Jacobs Ranch Mine is located about 15 miles south of the Cordero Rojo Mine (Figure 1-1). No elk have been observed recently within the Maysdorf LBA Tract but they are occasionally recorded in the Pine Hills east of the Cordero Rojo Mine.

3.10.2.2 Environmental Consequences

3.10.2.2.1 Proposed Action and Alternatives 2 and 3

Under the Proposed Action and Alternatives 2 and 3, big game would be displaced from portions of the Maysdorf LBA Tract to adjacent ranges during mining. Pronghorn would be most affected; however, no areas classified as crucial pronghorn habitat occur on or within two miles of the LBA tract. Mule deer would not be substantially impacted, given their infrequent use of these lands and the availability of suitable habitat in adjacent areas. White-tailed deer are not usually found in the area but are occasionally observed to the east. None of the land within the general analysis area is considered by WGFD to be an elk use area and no elk have been observed within the vicinity of the Maysdorf LBA Tract in recent years. Big game displacement would be incremental, occurring over several years and allowing for gradual changes in distribution patterns. Big game residing in the adjacent areas could be impacted by increased competition with displaced animals. Noise, dust, and associated human presence would cause some localized avoidance of foraging areas adjacent to mining activities. On the existing coal leases, however, big game have continued to occupy areas adjacent to and within active mining operations, suggesting that some animals may become habituated to such disturbances.

Big game animals are highly mobile and can move to undisturbed areas. There would be more restrictions on big game movement on or through the tract, however, due to the construction of additional fences, spoil piles, and pits related to mining. During winter storms, pronghorn may not be able to negotiate these barriers. WDEQ guidelines require fencing to be designed to permit pronghorn passage to the extent possible.

Following reclamation, topographic moderation and changes in vegetation may result in a long-term reduction in big game carrying capacity.

3.10.2.2.2 No Action Alternative

The impacts to big game under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2 and above for the existing Cordero Rojo Mine area.

3.10.3 Other Mammals

3.10.3.1 Affected Environment

A variety of small and medium-sized mammal species occur in the vicinity of the general analysis area, although not all have been observed on the LBA Tract itself. These include predators and furbearers, such as coyote (*Canis latrans*), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), striped skunk (*Mephitis mephitis*), long-tailed weasel (*Mustela frenata*), badger (*Taxidea taxus*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), and beaver (*Castor canadensis*). Prey species include various rodents (such as mice, rats, voles, gophers, ground squirrels, chipmunks, muskrats, and black-tailed prairie dogs) and lagomorphs (jackrabbits and cottontails). These prey species are cyclically common and widespread throughout the region. Porcupines (*Erethizon dorsatum*) and bats (such as hoary [*Lasiurus cinereus*] and big brown [*Eptesicus fuscus*]) also have habitat in the vicinity, primarily east of the Cordero Rojo Mine area. The prey species are important for raptors and other predators.

The black-tailed prairie dog was added to the list of candidate species for federal listing on February 4, 2000 (USFWS 2000a). The USFWS has since removed the black-tailed prairie dog from the list of candidate species (USFWS 2002a), but continues to encourage the protection of prairie dog colonies for their value to the prairie ecosystem and the myriad of species that rely on them (USFWS 2004).

The black-tailed prairie dog is a highly social, diurnally active, burrowing mammal. Aggregations of individual burrows, known as colonies, form the basic unit of prairie dog populations. Found throughout the Great Plains in shortgrass and mixed-grass prairie areas (Fitzgerald et al. 1994), the black-tailed prairie dog has declined in population numbers and extent of colonies in recent years. The three major impacts that have influenced black-tailed prairie dog populations are the initial conversion of prairie grasslands to cropland in the eastern portion of its range from approximately the 1880s-1920s; large-scale control efforts conducted from approximately 1918 through 1972, when an Executive Order was issued banning the use of compound 1080; and the introduction of sylvatic plague into North American ecosystems in 1908 (USFWS 2000b). In Wyoming, this species is primarily currently found in isolated populations in the eastern half of the state (Clark and Stromberg 1987). USFWS recently estimated that about 125,000 acres of black-tailed prairie dog occupied habitat exists in Wyoming (USFWS 2000b). Many other wildlife species, such as the black-footed ferret, swift fox, mountain plover, ferruginous hawk, and burrowing owl may be dependent on the black-tailed prairie dog for some portion of their life cycle (USFWS 2000b).

The species is considered a common resident in eastern Wyoming, utilizing shortgrass and mid-grass habitats (Luce et al. 1999). According to USDA-FS observations on the Thunder Basin National Grassland, the largest concentrations of prairie dog colonies in the vicinity of the eastern PRB surface coal mines are found east of the coal burnline, which is outside and east of the area of surface coal mining (Tim Byer, personal communication 9/11/2003). The large prairie dog complexes in this area east of the coal burnline have been drastically impacted by outbreaks of plague. The prairie dog colonies west of the burnline, including the areas near the Maysdorf LBA Tract, are generally smaller and less densely concentrated. These colonies have not been affected by plague.

Qualified wildlife biologists with Intermountain Resources have mapped the current acreage of prairie dog colonies in the vicinity of the Cordero Rojo Mine by walking the perimeters of colonies and delineating them on topographic maps. No colonies are currently present on or within two miles of the Maysdorf LBA Tract under the Proposed Action or Alternatives 2 or 3. One black-tailed prairie dog colony exists within one mile east of the Cordero Rojo Mine's current permit area while another town is located more than three miles west of the current mine permit area and the Maysdorf LBA Tract (Figure 3-13). The town located east of the CMC mine permit area is currently smaller than that depicted. The boundaries shown on Figure 3-13 are historical town boundaries and, although black-tailed prairie dogs still exist in the area, their numbers and distribution are currently much smaller than previously recorded.

3.10.3.2 Environmental Consequences

3.10.3.2.1 Proposed Action and Alternatives 2 and 3

Medium-sized mammals (such as lagomorphs, coyotes, and foxes) would be temporarily displaced to other habitats by mining, potentially resulting in increased competition and mortality. However, these animals would rebound as forage is developed or small mammal prey species recolonize the reclaimed areas. Direct losses of small mammals would be higher than for other wildlife, since the mobility of small mammals is limited and many will retreat into burrows when disturbed. Therefore, populations of such prey animals as voles, ground squirrels and mice would decline during mining. However, these animals have a high reproductive potential and tend to re-occupy and adapt to reclaimed areas quickly. A research project on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that reclamation objectives to encourage recolonization by small mammal communities are being achieved (Shelley 1992). That study evaluated sites at five separate mines.

Black-tailed prairie dogs would not be affected by leasing and mining the Maysdorf LBA Tract because no colonies are currently present on or within two miles of the tract as

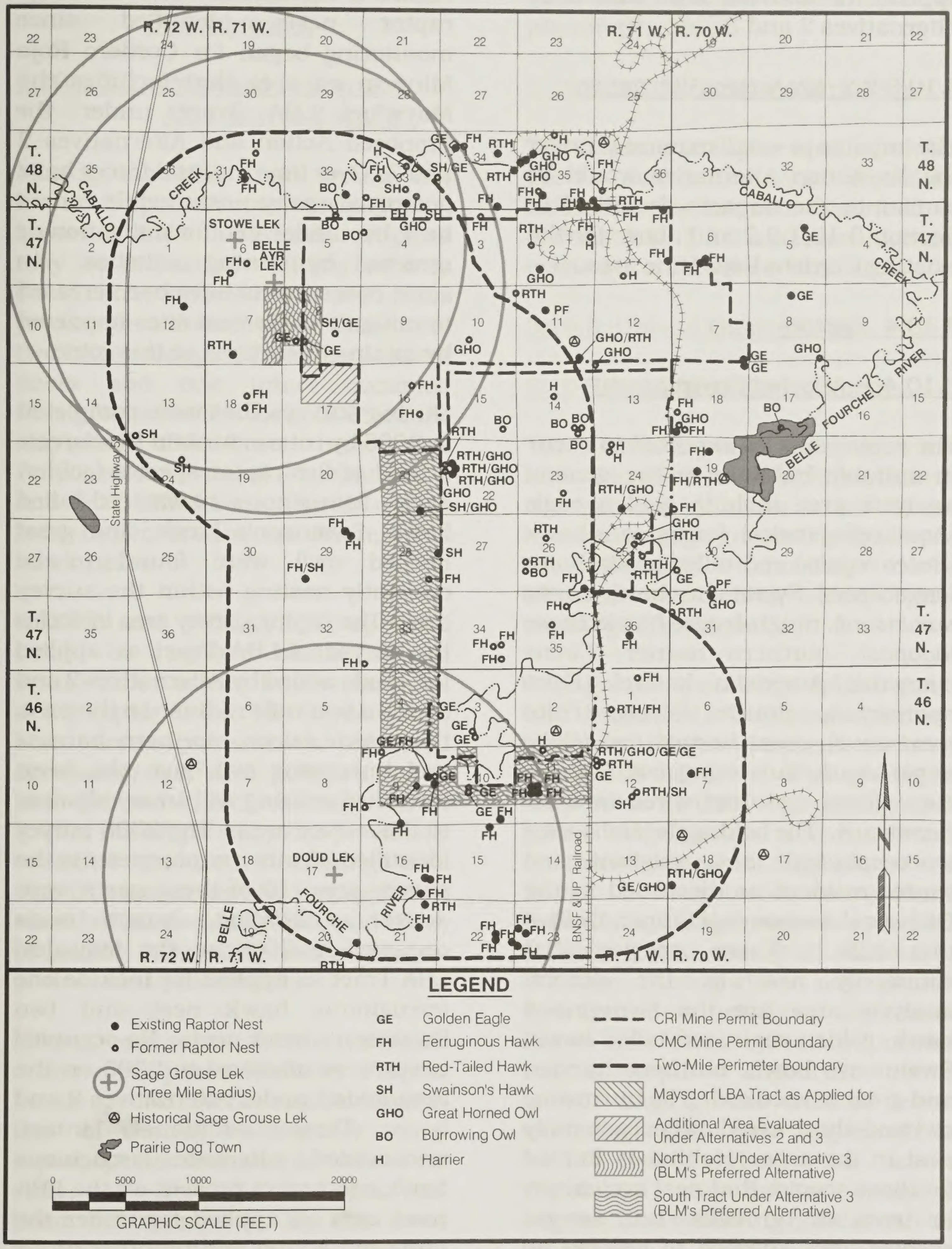

R. 72 W. R. 71 W.
R. 71 W. R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
STOWE LEK
BELLE AYR LEK
DOUD LEK
CABALLO CREEK
BELLE FOURCHE RIVER
State Highway 59
BNSF & UP Railroad
LEGEND
● Existing Raptor Nest
○ Former Raptor Nest
Sage Grouse Lek (Three Mile Radius)
Historical Sage Grouse Lek
Prairie Dog Town
GE Golden Eagle
FH Ferruginous Hawk
RTH Red-Tailed Hawk
SH Swainson's Hawk
GHO Great Horned Owl
BO Burrowing Owl
H Harrier
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Two-Mile Perimeter Boundary
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure 3-13. Raptor Nest Sites, Sage Grouse Leks, and Prairie Dog Towns Within and Adjacent to the Maysdorf LBA Alternative Tract Configurations.

applied for and the area added by Alternatives 2 and 3.

3.10.3.2.2 No Action Alternative

The impacts to small mammals under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2 and above for the existing Cordero Rojo Mine area.

3.10.4 Raptors

3.10.4.1 Affected Environment

The raptor species expected to occur in suitable habitats in the general analysis area include golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), rough-legged hawk (*Buteo lagopus*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), great horned owl (*Bubo virginianus*), burrowing owl (*Athene cunicularia*), and short-eared owl (*Asio flammeus*). The bald eagle (*Haliaeetus leucocephalus*) is a migrant and winter resident as discussed in the Biological Assessment (Appendix E) of this EIS. Those species that commonly nest in the general analysis area are the ferruginous hawk, golden eagle, red-tailed hawk, Swainson's hawk, northern harrier, and great horned owl. The burrowing owl and short-eared owl occasionally nest in the area. Habitat is limited for those species that nest exclusively in trees or on cliffs, but several species have adapted to nesting on the ground, creek banks, buttes, or rock outcrops.

Figure 3-13 shows the locations of raptor nests identified since monitoring began for Cordero Rojo Mine in an area that includes the Maysdorf LBA Tract under the Proposed Action and Alternatives 2 and 3. Over time, natural forces have destroyed many nests, while others have been relocated for mitigation or removed by mining activities. In some cases, nests have been created to mitigate other nest sites impacted by mining operations at this mine.

During surveys that were completed in 2005 by Intermountain Resources, a total of five raptor species (golden eagle, ferruginous hawk, red-tailed hawk, Swainson's hawk, and great horned owl) were found to be currently nesting within the survey area. The raptor survey area includes the Maysdorf LBA Tract as applied for, lands added by Alternatives 2 and 3, and a two-mile radius. In the past, the prairie falcon, northern harrier, and burrowing owl have also been identified nesting within or adjacent to the survey area. The 2005 survey identified 26 intact raptor nests in the survey area, 10 of these nests were active. Existing, intact nests occupied in 2005 on the Maysdorf LBA Tract as applied for include one ferruginous hawk nest and two Swainson's hawk nests. No occupied nests were observed in 2005 on the area added under Alternatives 2 and 3. Three additional, intact, unoccupied, alternate ferruginous hawk nests were present on the LBA tract area as applied for under the Proposed Action and no other intact raptor nests were present on the lands added under Alternatives 2 and 3.

3.10.4.2 Environmental Consequences

3.10.4.2.1 Proposed Action and Alternatives 2 and 3

Mining the LBA tract would not impact regional raptor populations; however, individual birds or pairs may be impacted. Mining activity could cause raptors to abandon nests proximate to disturbance. There were two intact occupied Swainson's hawk nests and one intact occupied ferruginous hawk nest in 2005 on the Maysdorf LBA Tract under the Proposed Action and Alternatives 2 and 3. USFWS recommends a one-mile buffer around all ferruginous hawk nests.

USFWS and WDEQ/LQD approval would be required before mining would occur within buffer zones for active raptor nests. The Cordero Rojo Mine annually monitors territorial occupancy and nest productivity on and around their existing leases. Raptor nesting activity has previously occurred in active mining and construction areas and the applicant mine has successfully executed state-of-the-art mitigation techniques to protect nest productivity.

Mining near raptor territories would minimally impact availability of raptor forage species. At the applicant mine, lack of nesting habitat for many raptor species that nest in trees or on cliffs, not a lack of forage area, has been determined to be the most important limiting factor. During mining, nesting habitat is created by the excavation process (highwalls), as well as through enhancement efforts (nest platforms, nest boxes, and tree plantings).

3.10.4.2.2 No Action Alternative

The impacts to raptor species under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2 and above for the existing Cordero Rojo Mine area.

3.10.5 Upland Game Birds

3.10.5.1 Affected Environment

Three upland game bird species are known to occur in suitable habitats in the general analysis area. These species are sage grouse (*Centrocercus urophasianus*), mourning doves (*Zenaida macroura*), and gray partridge (*Perdix perdix*).

Sage grouse are a large upland game bird considered a "landscape species", annually using widespread areas of sagebrush habitats. This grouse is referred to as both sage grouse and greater sage grouse, and the terms are interchangeable. Sage grouse are found in sagebrush shrub-land habitat, and sagebrush is essential for sage grouse during all seasons of the year. During winter, sage grouse feed almost exclusively on sagebrush leaves and buds. Suitable winter habitat requires sagebrush above snow. Sage grouse tend to select wintering sites where sagebrush is 10-14 inches above the snow. Population and habitat analyses suggest that wintering habitat can be as limiting as mating and breeding habitats. Breeding occurs on strutting grounds (leks) during late March and April. Leks are generally situated on sites with low vegetation and little or no sagebrush, broad ridge tops, grassy openings, and disturbed sites such as burns, abandoned well locations, airstrips or roads. However, often there are areas of denser sagebrush near the lek that are used for foraging, loafing, and hiding cover (WGFD 2003). Approximately two-thirds of hens nest within three miles of the lek where they were bred. The rest of the hens usually nest within 15 miles of the lek. Sage grouse typically nest under tall sagebrush, but may use other large shrubs. Sagebrush stands used for nesting range in height from eight to 18 inches, with individual plants reaching up to 32 inches tall. Both new spring herbaceous growth and residual cover are important in the understory for nesting sage grouse (WGFD 2003). Hens move their brood immediately upon hatching from the nest site to brood-rearing areas. Sites used during the first 10-14 days after hatching are typically within 1.5 miles of the nest. The vast majority of chick mortality (87 percent of total brood loss in four studies conducted in Wyoming) occurs during this period. After the first 10 days, broods may have dispersed five or more miles from the nest. As summer progresses and food plants mature and dry, sage grouse move to areas still supporting succulent herbaceous vegetation. They continue to rely on adjacent sagebrush for protection from weather and predators, and for roosting and loafing. Sage grouse normally move off late brood-rearing habitat onto transitional fall habitat before moving onto winter range (WGFD 2003).

On and after July 2, 2002, the USFWS received three petitions requesting that the greater sage grouse be listed as endangered across its entire range. Following a 12-month status review of the best available scientific and commercial information on the species, the USFWS found that listing was not warranted at this time. However, the USFWS continues to have concerns regarding sage grouse population status, trends and threats, as well as concerns for other sagebrush obligates (USFWS 2005). USFWS has indicated there is a need for continued efforts to conserve sage grouse and sagebrush habitat on a long-term basis. USFWS encourages continued development and implementation of conservation strategies throughout the grouse's range.

Experimental studies at the USDA National Wildlife Research Center have shown that West Nile virus is usually fatal to sage grouse, resulting in death within six days of infection (USGS 2006). The disease was first detected in sage grouse in the PRB in 2003. That year, the deaths of 11 sage grouse in northeastern Wyoming were confirmed from West Nile virus in August and early September. In 2004 and 2005 combined, five sage grouse in the PRB were found to have died from the disease. Summer temperatures in 2004 and 2005 were cooler than normal, while 2003 was warmer than normal. The lower temperatures in 2004 and 2005 are believed to have contributed to the reduced mortality rate during those years (WGFD 2006). The warmer summer of 2006 was accompanied by increased sage grouse mortality due to West Nile virus (USGS 2006). Lek, or strutting ground, count data indicate that Wyoming's sage grouse populations increased slightly in 2004 and 2005.

In May 2002, the USFWS office in Cheyenne, Wyoming released a list entitled *Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming*, which replaced the previous *Migratory Birds of High Federal Interest List*. The greater sage grouse is included on the new list and, as a result, the presence of sage grouse and sage grouse sign are included in the annual migratory bird surveys that are conducted by the coal mines in both spring and summer.

Cordero Rojo Mine conducts surveys to identify new sage grouse leks and sage grouse lek attendance at previously identified leks in the spring as part of the annual wildlife surveys that are conducted for the mine. These surveys and baseline inventories, which include the mine's permit area and a one-mile perimeter, were initiated in the mid-1970s to early 1980s when the CRI and CMC Mines were initially permitted. As a result, most of the area included in the proposed Maysdorf LBA Tract has been included in previous annual survey areas.

The sage grouse is a yearlong resident and is occasionally encountered in the general analysis area. The most abundant vegetation type on the tract is the Sagebrush Grassland type, which is characterized by the moderate to heavy presence of Wyoming big sagebrush (Section 3-10). However, at the present time sage grouse do not appear to be abundant or common in the area. Three active sage grouse leks have been surveyed within the general analysis area, the Stowe, Belle Ayr, and Doud leks (Figure 3-13). Each lek is generally surveyed three times each breeding season. Seven historical leks (no attendance observed in the past 10 years) are located within or adjacent to the general analysis area. Figure 3-13 shows the location of the three active leks and the seven historical lek sites. The Belle Ayr lek, located immediately north of the proposed lease area, was first documented in 1990. The peak number of males was 12 in 1991, while no males were recorded in surveys conducted in 1992, 1993, or 2004. One male was recorded on the Belle Ayr lek in 2005. Attendance has been relatively low, averaging only about four males over the last 16 years. The Stowe lek, located approximately 0.25 miles west and 0.6 miles north of the proposed lease area, was first identified in 2000. The Stowe lek had a peak of eight males in 2001, but no birds were recorded on this lek in 2003, 2004, or 2005. The Doud lek was first recorded in 1999 and is located over one mile away from the southwest corner of the proposed lease area. A maximum of seven males were recorded at the Doud lek in 2003, but no birds were in attendance in 2004 or 2005. Research has indicated that most (approximately two-thirds) hens will nest within three miles of the lek where they were bred. The remainder of the birds usually nest within 15 miles of the lek (WGFD 2003). The three-mile radius around the Stowe, Belle Ayr, and Doud leks extends onto the LBA tract as applied for (Figure 3-13).

Mourning doves are a migrant and relatively common in the area during migration, particularly near sites with water sources and trees and in the summer for breeding and nesting. This species is a relatively common breeding bird in Campbell County and may be found in a variety of habitat types. Mourning doves were common on the survey area in 2005.

Gray (or Hungarian) partridge, an introduced species, have been infrequently observed on reclaimed areas, sagebrush shrublands, upland grassland, and cultivated lands. In some years this species is occasionally encountered while in other years partridge appear to be totally absent. The Hungarian partridge has not been observed on the survey area in 2005.

3.10.5.2 Environmental Consequences

3.10.5.2.1 Proposed Action and Alternatives 2 and 3

Overall, the sage grouse population has been steadily declining in Wyoming and across the rest of the west. A study prepared by the Western Association of Fish and Wildlife Agencies (Connelly et al. 2004) estimated that sage grouse populations in western North America declined at an overall rate of 2.0 percent per year from 1965 to 2003. The decline rate was larger from 1965 to 1985, with populations stabilizing and some increasing from 1986 to 2003. For Wyoming, this study estimated that sage grouse populations declined at an average rate of 9.66 percent from 1968 to 1986, and at an average rate of 0.33 percent per year from 1987 to 2003. Population lows were reached in the mid-1990s and there has been some gradual increase in numbers since that time (Connelly et al. 2004).

The Maysdorf LBA Tract is within the Northeast Wyoming Local Sage-Grouse Working Group (NWLWG) Area, which includes portions of the WGFD Sheridan and Casper regions and the Thunder Basin National Grassland, which is located south of the Maysdorf LBA Tract. Sage grouse monitoring has occurred within the NWLWG since 1967. Within this area, sage grouse population trends have exhibited a cyclical pattern, with each successive peak of a cycle being lower than the preceding peak. This suggests a long term population decline since at least 1967 (Figure 3-14).

Population trends within the NWLWG appear to be mirroring statewide trends in Wyoming, although the average number of males per lek in the NWLWG Area, including in the Thunder Basin National Grassland, has typically been lower than those observed state wide (Figure 3-15). Since 1996, sage grouse populations within the state and in northeast Wyoming have fluctuated but exhibited an overall increase, with a recent peak in male lek attendance occurring in 2000 or 2001.

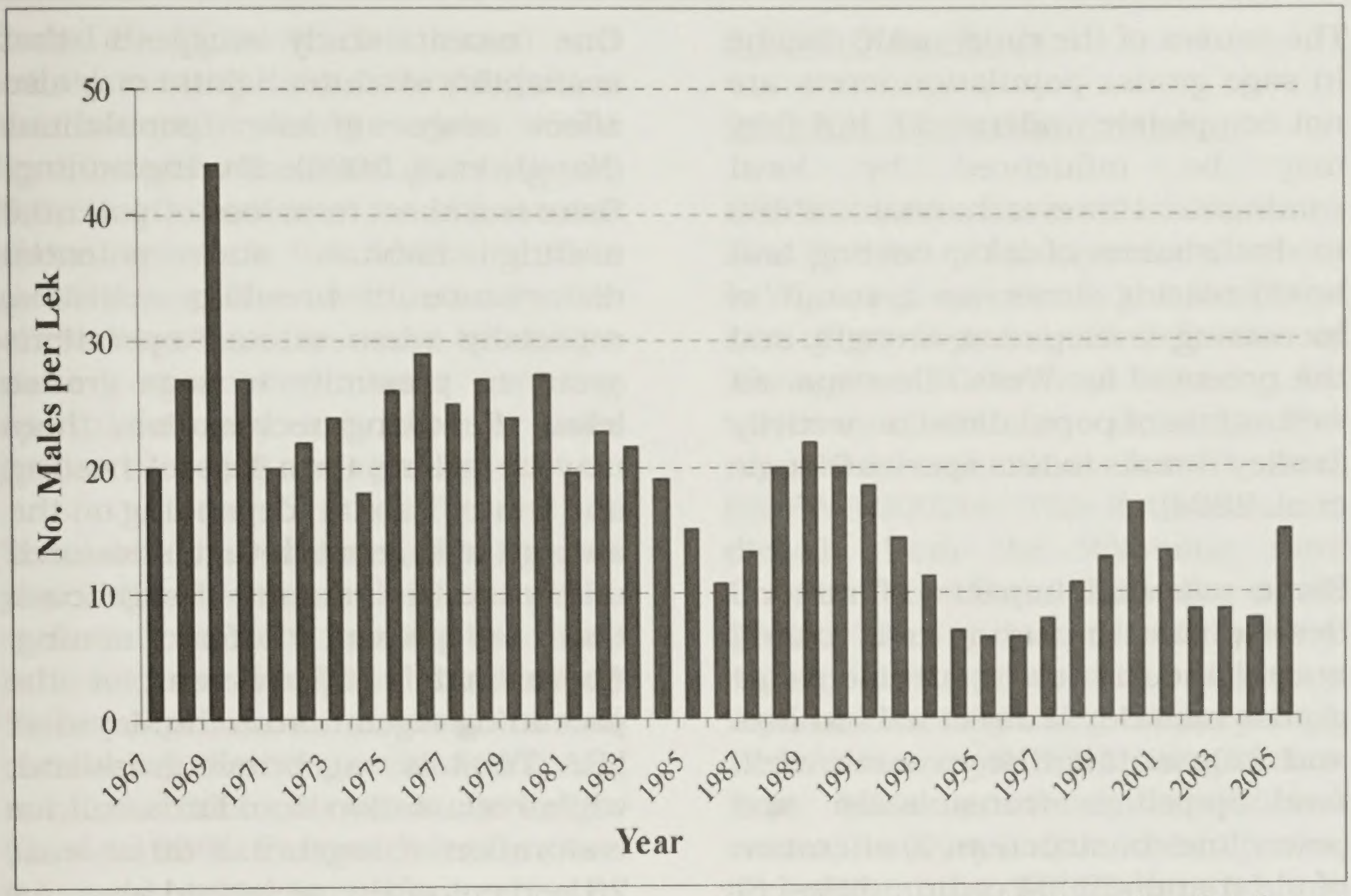


Figure 3-14. Average Male Sage Grouse Lek Attendance Within the Northeast Wyoming Local Working Group Area (1967-2005).

Source: USDA-FS (2006)

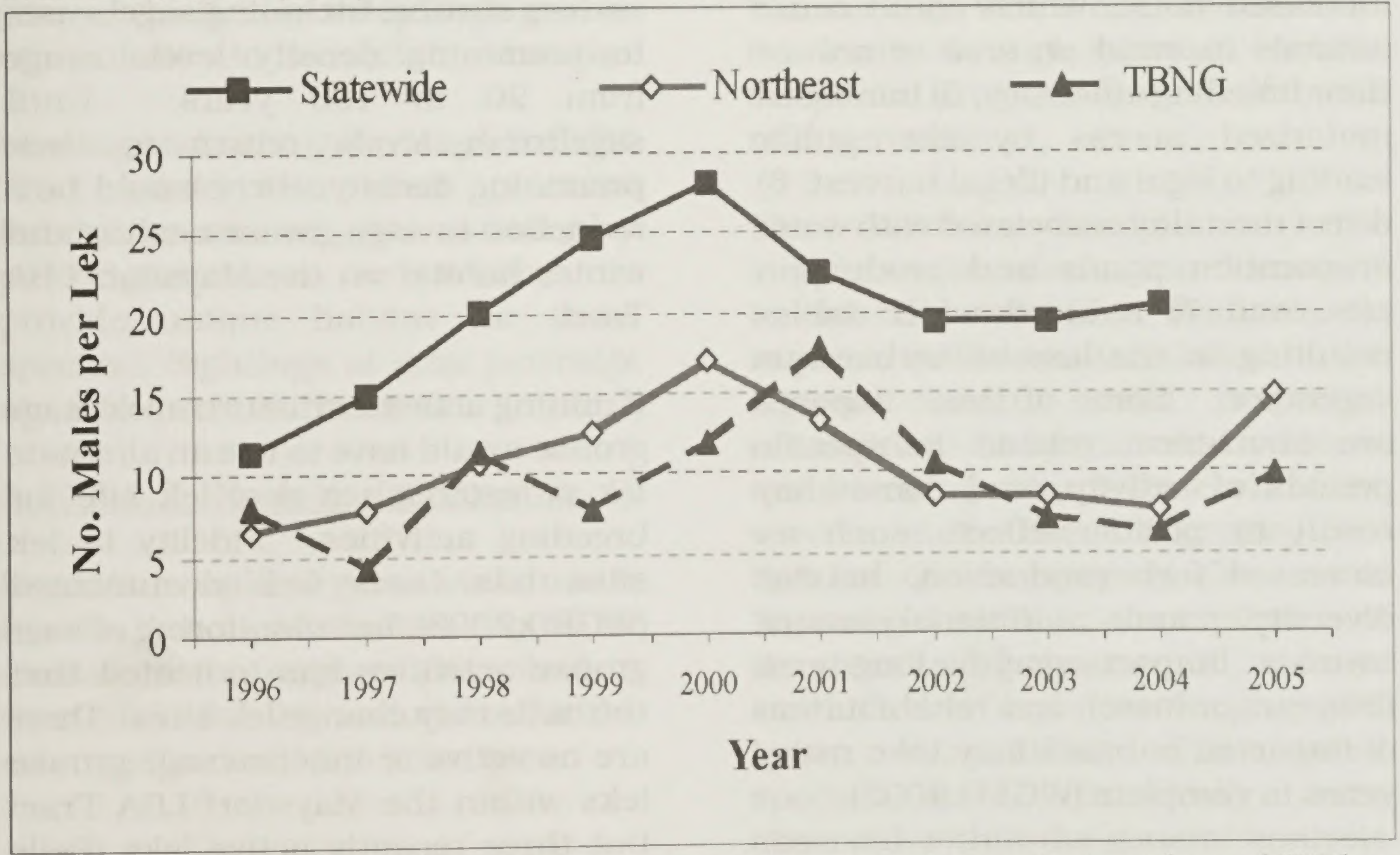


Figure 3-15. Average Male Sage Grouse Lek Attendance Statewide and Within the Northeast Wyoming Local Sage Grouse Working Group Area and the Thunder Basin National Grasslands (1996-2005).

Source: USDA-FS (2006)

The causes of the range-wide decline in sage grouse population levels are not completely understood, but they may be influenced by local conditions. However, habitat loss due to disturbance of leks, nesting and brood-rearing areas as a result of increasing development, drought, and the potential for West Nile virus, as well as loss of population connectivity are key threats to this species (Naugle et al. 2004).

Some potential impacts of mineral development (including coal mining and oil and gas development) on sage grouse include: 1) direct habitat loss and fragmentation from mine, well, road, pipeline, transmission and power line construction, 2) alteration of plant and animal communities, 3) increased human activity which could cause animals to avoid the area, 4) increased noise, which could cause animals to avoid an area or reduce their breeding efficiency, 5) increased motorized access by the public leading to legal and illegal harvest, 6) direct mortality associated with water evaporation ponds and production pits, and 7) reduced water tables resulting in the loss of herbaceous vegetation. Some of these impacts are short-term related to specific periods of activity, and some may result in positive effects such as increased forb production, habitat diversity, and additional water sources. Impacts may be long-term (30 years or more), and rehabilitation of impacted habitats may take many years to complete (WGFD 2003).

Areas of suitable habitat for nesting and strutting grounds are needed to sustain sage grouse populations. One recent study suggests that availability of winter habitat may also affect sage grouse populations (Naugle et al. 2006). During mining, there is a short term loss of potential nesting habitat and potential disturbance to breeding activities, especially when mining operations occur in proximity to sage grouse leks. Following reclamation, there may be a long term loss of nesting and winter habitat, depending on the amount of sagebrush that is restored relative to the amount of sagebrush that is present before mining. Approximately 55 percent of the premining vegetation on the Maysdorf LBA Tract is sagebrush grassland, while reclamation standards call for restoration of sagebrush on at least 20 percent of the reclaimed area. As discussed in Section 3.9.2.1, estimates for the time it would take to restore shrubs, including sagebrush, to premining density levels range from 20 to 100 years. Until sagebrush levels return to their premining density, there would be a reduction in sage grouse nesting and winter habitat on the Maysdorf LBA Tract.

If mining activities disturb a lek, sage grouse would have to use an alternate lek or establish a new lek site for breeding activities. Fidelity to lek sites has been well documented (WGFD 2003), but monitoring of sage grouse activities has indicated that the birds may change lek sites. There are no active or inactive sage grouse leks within the Maysdorf LBA Tract but three recently active leks (Belle Ayr, Stowe, and Doud) are located within three miles of the tract under the Proposed Action and Alternatives

2 and 3. If the tract is leased and mined, nesting habitat for the grouse that have attended these leks would be affected by the mining activity on the tract because, as discussed above, research has indicated that most hens will nest within three miles of the lek where they were bred. The noise associated with mining operations may also disrupt sage grouse breeding and nesting.

There is some evidence that grouse populations do repopulate areas after reclamation for the species, but there is no evidence that populations attain their previous levels and reestablishment in reclaimed areas may take 20 to 30 years, or longer (Braun 1998). Estimates for the time it would take to restore shrubs, including sagebrush, to premine density levels range from 20 to 100 years, which may delay sage grouse repopulation in the reclaimed areas.

Leasing and mining the Maysdorf LBA Tract would also affect potential habitat for mourning doves and gray partridge; however, the tract does not provide unique habitat for these species. Sightings of gray partridge are infrequent in this area.

3.10.5.2.2 No Action Alternative

Impacts to upland game birds under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2 and above for the existing Cordero Rojo Mine area.

3.10.6 Other Birds

3.10.6.1 Affected Environment

USFWS uses a list entitled *Migratory Bird Species of Management Concern in Wyoming*, specifically the *Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming*, for reviews related to existing and proposed coal mine leased land (USFWS 2002b). This list was taken directly from the Wyoming Bird Conservation Plan (Cerovski et al. 2000). The *Migratory Bird Species of Management Concern in Wyoming* replaced the *Migratory Birds of High Federal Interest* (MBHFI) list. Cordero Rojo Mine previously conducted annual surveys for the species included on the MBHFI list and now conducts annual surveys for the species included on the coal mine list. The surveys, which are conducted in the winter through summer, include the permit area and a one-half to one mile perimeter.

The Wildlife Section of the supplemental information document to this EIS, which is available on request, includes a tabulation of the regional status and expected occurrence, historical observations, and breeding records for each of the species on the list of *Migratory Bird Species of Management Concern in Wyoming*, based on a compilation of the results of the annual surveys conducted on and near the proposed lease area. Fifteen of the listed species have historically been observed within the general analysis area. The species usually observed nesting in the area include the ferruginous hawk, Swainson's hawk, greater sage grouse, loggerhead shrike (*Lanius ludovicianus*), Brewer's sparrow (*Spizella breweri*), vesper sparrow (*Pooecetes gramineus*), lark bunting (*Calamospiza melanocorys*), and McCown's longspur (*Calcarius mccownii*). The upland sandpiper (*Bartramia longicauda*), burrowing owl, short-eared owl, chestnut-collared longspur (*Calcarius ornatus*), and the grasshopper sparrow (*Ammodramus savannarum*) may also nest in the area but less frequently because nesting habitat for these species is not abundant. The bald eagle is only observed in the winter or as a migrant and the long-billed curlew (*Numenius americanus*) has only been observed as a migrant.

The mountain plover (*Charadrius montanus)* is included on the list of *Migratory Bird Species of Management Concern in Wyoming*. The mountain plover was designated as a proposed threatened species by the USFWS in October 2001 (USFWS 2001). USFWS subsequently published a withdrawal of the proposed rule to list the mountain plover as threatened on September 9, 2003, (USFWS 2003). The USFWS continues to encourage provisions that would provide protection for this species, as it continues to be protected under the Migratory Bird Treaty Act and as a sensitive species under BLM policy (Bureau Manual 6840.06 E. Sensitive Species).

The mountain plover is a migratory species of the shortgrass prairie and shrub-steppe eco-regions of the arid West. This species utilizes high, dry, shortgrass prairie with vegetation typically shorter than four inches tall. Mountain plovers often use black-tailed prairie dog towns for breeding, nesting, and feeding. Not all prairie dog towns offer suitable habitat for the mountain plover, mostly due to topographic incompatibility. There are also habitats other than prairie dog towns that provide nesting, feeding, and breeding habitat for mountain plovers.

The nest of the mountain plover consists of a small scrape on flat ground in open areas. Mountain plovers arrive on their breeding grounds in late March with egg-laying beginning in late April. Breeding plovers show close site fidelity, often returning to the same territory in subsequent years. Clutches are hatched by late June and chicks fledge by late July. The fall migration begins in late August and most birds are gone from the breeding grounds by late September.

Wildlife surveys conducted at the Cordero Rojo Mine since the 1970s have failed to detect the presence of this species in the area. The survey area, which includes the Cordero Rojo Mine permit area and a half-mile perimeter, is inventoried for suitable mountain plover habitat annually. Qualified wildlife biologists with Intermountain Resources keep watch during all surveys and site visits for all migratory birds of potential concern and habitats that could support them. Data is included in Cordero Rojo Mine's annual wildlife monitoring reports to WDEQ/LQD as required by the "monitoring and mitigation plan for raptors and species of High Federal Interest" approved for Cordero Rojo Mine by the USFWS. Mountain plover preferred habitat consists of level, open and exceedingly grazed sites (Knopf 1996) that are generally lacking in the Cordero Rojo Mine survey area and the Maysdorf LBA study area. Prairie dog towns can provide habitat for the mountain plover, although no colonies exist within the tract as applied for and the area added by Alternatives 2 and 3. No sightings of mountain plover have ever been recorded in the vicinity of the LBA tract.

The bald eagle is seasonally common and most frequently observed during the winter months. The burrowing owl is uncommon and is observed as an occasional breeder in the general analysis area. Sage grouse, recently added to the Level 1 list, are becoming less common in the general analysis area but are still classified as a common breeder on and in the near vicinity of the Maysdorf LBA Tract (see Section 3.10.5 above). Additional information about the observed occurrence of the bald eagle in the general analysis area can be found in the Biological Assessment (Appendix E).

Suitable nesting habitat is scarce if not absent in the general analysis area for the remainder of the *Migratory Bird Species of Management Concern in Wyoming*; therefore, the other species have rarely or never been recorded.

Under natural conditions, the Maysdorf LBA Tract provides limited waterfowl and shorebird habitat. The natural aquatic habitat, prior to CBNG development within the Belle Fourche River drainage basin, was mainly available during spring migration as ponds (primarily stock reservoirs and playa areas) and ephemeral streams. Many of these water features generally got quite low or dried up during the summer. However, the relatively recent development of CBNG resources upstream and within the general analysis area has supplied the river, its tributaries, ponds, and playas with water nearly continuously, resulting in an increase in habitat for waterfowl and shorebird species. Broods from the American wigeon (*Anas Americana*), blue-winged teal (*Anas discors*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), gadwall (*Anas strepera*), and green-winged teal (*Anas crecca*) were observed during 2005.

3.10.6.2 Environmental Consequences

3.10.6.2.1 Proposed Action and Alternatives 2 and 3

Of the fifteen *Migratory Bird Species of Management Concern in Wyoming* that have historically been observed in the general analysis area, the Level 1 species (those identified as needing conservation action) that have been recorded nesting in the area include the ferruginous hawk, burrowing owl, greater sage grouse, Brewer's sparrow, Swainson's hawk, and McCown's longspur. Level 1 species that do not have abundant nesting habitat available in the general analysis area, but have been documented to nest include the short-eared owl and upland sand piper. Other Level 1 species observed in the area include the long-billed curlew and bald eagle.

The existing habitat for these species on the Maysdorf LBA Tract would be destroyed during mining. The habitat loss would be short-term for grassland species, but would last longer for shrub-dependent species. There are currently no trees on the LBA tract. Cordero Rojo Mine's current reclamation practices are designed to provide a mosaic of upland grass and sagebrush habitats that would potentially host most of these species. A research project on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that the diversity of song birds on reclaimed areas was less than on adjacent undisturbed areas, although their overall numbers were greater (Shelley 1992).

No impacts to mountain plovers are anticipated because they have not been observed in the vicinity of the LBA tract during wildlife surveys conducted for the Cordero Rojo Mine that began in the 1970s, and the typical suitable habitat for this species is not currently present on the tract.

Potential impacts to the bald eagle, sage grouse and other raptors in general, as well as measures in place to prevent impacts to these species from existing mining operations are included in the preceding discussions or in Appendix E.

Mining the LBA tract would have a negligible effect on migrating and breeding waterfowl and shorebirds. Sedimentation ponds created during mining would provide interim habitat for these fauna. The Belle Fourche River diversion channel would not provide the same habitat as the natural river channel, although natural streamflow and the presence of CBNG discharge water would not be affected. Cordero Rojo Mine's current reclamation plan requires that the portion of the river channel affected by currently permitted mining be reclaimed to restore its premining functions and aquatic habitats. If the LBA tract is leased and mined, these reclamation efforts would be extended onto the portion of the river affected by mining the tract. Replacement of all impacted jurisdictional wetlands would be required in accordance with Section 404 of the Clean Water Act (Section 3.7). If the replaced wetlands on the Maysdorf LBA Tract do not duplicate the exact function and/or landscape features of the premine wetlands, waterfowl and shorebirds could be beneficially or adversely affected as a result.

3.10.6.2.2 No Action Alternative

Impacts to migratory bird species, waterfowl, and shorebirds under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2 and above for the existing Cordero Rojo Mine area.

3.10.7 Amphibians, Reptiles, and Aquatic Species

3.10.7.1 Affected Environment

Wildlife surveys completed specifically for the applicant and adjacent mines, as well as biological research projects in the eastern PRB, have documented numerous other wildlife species that inhabit the region, including various amphibians, reptiles, and aquatic species. All these species are generally common inhabitants of the area.

Under natural conditions, aquatic habitat is limited by the ephemeral nature of surface waters in the general analysis area. The lack of deep-water habitat and extensive and persistent water sources limits the presence and diversity of fish and other aquatic species. Fish surveys were conducted in the Belle Fourche River during baseline studies for the Cordero Rojo Mine in 1975 and on the Maysdorf LBA Tract in 2005. These surveys were completed in the southern and southeastern portion of the existing Cordero Rojo Mine area in 1975 and throughout the Maysdorf LBA Tract in 2005. Fish species observed during those surveys include the common carp (*Cyprinus carpio*), creek chub (*Semotilus atromaculatus*), flathead chub (*Platygobio gracilis*), sand shiner (*Notropis stramineus*), brassy minnow (*Hybognathus hankinsoni*), fathead minnow (*Pimephales promelas*), white sucker (*Catostomus commersoni*), black bullhead (*Ameiurus melas*), green sunfish (*Lepomis cyanellus*), and yellow perch (*Perca flavescens*). The most abundant fish were the white sucker and various minnow species.

As discussed above, water discharged from CBNG wells has recently supplied the Belle Fourche River and some tributaries, ponds, and playas with water nearly continuously, resulting in an increase in habitat for aquatic species. However, in July of 2005 only 40 percent of the river's channel length through the Maysdorf LBA Tract contained water, while the remaining 60 percent of the channel length was dry. These observations document that this reach of the Belle Fourche River has not become perennial, even with the addition of CBNG discharge water.

In 1997, the Belle Fourche River was sampled at Section 19, T.46N., R.71W., which is several miles upstream from the Maysdorf LBA Tract. The black bullhead, creek chub, carp, fathead minnow, green sunfish, sand shiner, and white sucker were found during those surveys (Patton 1997). WGFD has categorized the black bullhead as a Status 3 species. Status 3 species are widely distributed throughout their native range with stable populations; however, habitat is declining or vulnerable.

Excluding the black bullhead, none of the other aquatic species found during the 1975, 1997, or 2005 surveys are of specific concern to state or federal agencies and the Belle Fourche River channel through the Maysdorf LBA Tract is not considered a viable fishery. The site rating for this stream reach was poor to very poor, based on the 2005 macroinvertebrate samplings and the WDEQ Indices.

Numerous reptile and amphibian species have been recorded during the various surveys on the Cordero Rojo Mine area and adjacent lands, including the LBA tract. These species include the tiger salamander (*Ambystoma tigrinum*), plains spadefoot (*Scaohiopus bombifrons*), great plains toad (*Bufo cognatus*), boreal chorus frog (*Pseudacris triseriata maculata*), northern leopard frog (*Rana pipiens*), common snapping turtle (*Chelydra serpentina serpentina*), western painted turtle (*Chrysemys picta belli*), eastern short-horned lizard (*Phrynosoma douglassi brevirostre*), northern sagebrush lizard (*Sceloporus graciosus graciosus*), prairie rattlesnake (*Crotalus viridis viridis*), plains hognose snake (*Heterondon nasicus nasicus*), bullsnake (*Pituophis melanoleucas sayi*), western plains garter snake (*Thamnophis radix haydeni*), red-sided garter snake (*Thamnophis sirtalis parietalis*), and eastern yellowbelly racer (*Coluber constrictor flaviventris*). The abundance of these reptiles and amphibians is difficult to determine but these species appear to be common to the area.

3.10.7.2 Environmental Consequences

3.10.7.2.1 Proposed Action and Alternatives 2 and 3

Mining the tracts would remove habitat for aquatic species, amphibians and reptiles in a portion of the Belle Fourche River and sections of the ephemeral tributaries to the Belle Fourche. Although the channel and surface water flow would be restored during reclamation, the river would be diverted and habitat for these species would be lost during mining operations. Under natural conditions, habitat for aquatic species is limited on the Maysdorf LBA Tract, however, as discussed above, a variety of aquatic species and reptiles and amphibians have been observed on and in the vicinity of the tract.

Under jurisdiction of Cordero Rojo Mine's current WDEQ/LQD mine permit, two sections of the Belle Fourche River have been diverted in order to recover coal from the existing coal leases (Section 3.5.2.1). A portion of one of these existing diversion channels that was approved by WDEQ in 1996 (WDEQ/LQD 1996) is within the Maysdorf LBA Tract as applied for.

Reclamation of the river channel and restoration of surface water flow quantity and quality after mining to approximate pre-mining conditions would restore fish habitat and aquatic resources of the Belle Fourche River.

3.10.7.2.2 No Action Alternative

Impacts to reptiles, amphibian, and aquatic species under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2 and above for the existing Cordero Rojo Mine.

3.10.8 Threatened, Endangered, Proposed, and Candidate Animal Species, and BLM Sensitive Species

Refer to Appendices E and F.

3.10.9 Regulatory Compliance, Mitigation and Monitoring

Regulatory guidelines and requirements designed to prevent or reduce surface coal mining impacts to wildlife include:

- fencing designed to permit pronghorn passage to the extent possible;
- creation of raptor nests to mitigate other nest sites impacted by mining operations at this mine;
- relocation of active raptor nests that would be impacted by mining in accordance with the approved raptor monitoring and mitigation plan;
- obtaining a permit for removal and mitigation of golden eagle nests;
- buffer zones for protection of raptor nests;
- restriction of mine-related disturbances from encroaching in the near vicinity of any active raptor nest from March until hatching;
- restriction of disturbances near raptor nests containing nestlings to prevent danger to, or abandonment of, the young;
- creation of nesting habitat through enhancement efforts (nest platforms, nest boxes, and tree plantings);
- reestablishment of the ground cover necessary for the return of a suitable raptor prey base after mining;
- restoration of sage grouse habitat after mining including reestablishment of sagebrush and other shrubs on reclaimed lands and grading of reclaimed lands to create swales and depressions;
- development of a *Raptor and Migratory Birds of High Federal Interest (MBHFI) Monitoring and Mitigation Plan* which must be approved by USFWS;
- required use of raptor-safe power lines;
- restoration of diverse landforms, direct topsoil replacement, and the construction of brush piles, snags, and rock piles to enhance habitat for wildlife;
- restoration of habitat provided by jurisdictional wetlands; and
- reclamation of the river channel and restoration of surface water flow quantity and quality after mining to approximate pre-mining conditions.

CMC's current mine permit requires reconstruction of bed form features in the Belle Fourche River channel, such as pools and runs, that should help restore the channel's natural function, as well as provide habitat. Restoration will be achieved by salvaging sufficient material from channel terrace alluvium to reconstruct pool features. Current reclamation, as well as future reclamation of the Belle Fourche River by the Cordero Rojo Mine would incorporate alluvium salvaged from the original channel.

These measures are included in the existing mining and reclamation permit and would be included in the amended mining and reclamation plans, if the LBA tract were leased and proposed for mining.

Baseline wildlife surveys were conducted for the Cordero and Caballo Rojo mines before mining operations began at either mine. Annual wildlife monitoring surveys have been conducted since the mid-1970s. These surveys are required by state and federal regulations. The wildlife monitoring surveys cover the area included in the mine permit area and a perimeter beyond the permit area that varies in size according to the species being surveyed. As a result, a majority of the Maysdorf LBA Tract has been surveyed as part of the required monitoring surveys for both the Cordero Rojo and the Belle Ayr mines.

The annual monitoring program includes:

- winter surveys of raptors and migratory birds wintering or nesting in the area;
- spring surveys for new and/or occupied raptor nests, upland game bird lek locations, T&E species and migratory birds;
- late spring surveys of raptor production for occupied nests, opportunistic observations of all wildlife species, T&E species, and migratory birds;
- annual surveys of raptor territorial occupancy and nest productivity on and around the existing leases; and
- summer surveys for raptors, migratory birds, and lagomorph density.

Monitoring data were collected by all of the surface coal mines in the PRB for big game species until 1999. At that time, the WGFD reviewed monitoring data and requirements for big game species on those mine sites. They concluded that the monitoring had demonstrated a lack of impacts to big game on existing mine sites. No severe mine-caused mortalities had occurred and no long-lasting impacts on big game had been noted on existing mine sites. The WGFD therefore recommended at that time that big game monitoring be discontinued on all existing mine sites. New mines will be required to conduct big game monitoring if located in crucial winter range or in significant migration corridors, neither of which are present within the general analysis area.

There is an approved raptor monitoring and mitigation plan for the Cordero Rojo mine. This monitoring and mitigation plan would be amended to include the Maysdorf LBA Tract if it is leased and proposed for mining. The amended raptor mitigation plan would be subject to review and approval by USFWS before the amended mining plan is approved.

Thunderbird Wildlife Consulting, Inc. of Gillette, Wyoming is currently conducting an independent research project to investigate how sage grouse use the landscape in the vicinity of active coal mines and how lands can be reclaimed to benefit those populations. This project is being funded by several of the surface coal mines located south of the Cordero Rojo Mine, AML Research Program, and WGFD.

Mitigation plans for Migratory Bird Species of Management Concern have been developed in cooperation with USFWS for the existing Cordero Rojo mining operations, and those plans would be amended to include the LBA tract. If additional species are documented nesting or using the area regularly, a mitigation plan would be developed to protect those birds and their habitat.

3.10.10 Residual Impacts

Although the Maysdorf LBA Tract would be reclaimed in accordance with the requirements of SMCRA and Wyoming statutes, there would be some residual wildlife impacts. The topographic moderation would result in a permanent loss of habitat diversity and a potential decrease in slope-dependent shrub communities. This would reduce the carrying capacity of the land for shrub-dependent species. Reclamation standards may limit replacement of habitat for some species, such as mountain plover. Some species, such as sage grouse, may repopulate reclaimed areas but populations may not attain pre-mining levels.

3.11 Land Use and Recreation

3.11.1 Affected Environment

Surface ownership within the Maysdorf LBA Tract as applied for under the Proposed Action and the lands added under Alternatives 2 and 3 consists primarily of private lands with some intermingled federal lands. The federally owned lands included in the tract are administered by the BLM. Surface ownership for the Maysdorf LBA Tract is listed in Table 3-11 and shown in Figure 3-16.

Table 3-11. Distribution of Surface Ownership Within the Maysdorf LBA Tract as Applied for Under the Proposed Action and Area Added Under Alternatives 2 and 3.

	Federal Ownership		**Private Ownership**	
LBA Tract Configuration	**(Acres)**	**(Percent)**[1]	**(Acres)**	**(Percent)**[1]
Area as Applied for	132.13	3.4	2,098.0	58.5
Area Added Under Alternatives 2 and 3[2]	275.49	8.0	1,082.0	30.1
Total	**407.62**	**11.4**	**3,180.0**	**88.6**

[1] Based on total acres (Proposed Action plus Alternatives 2 and 3).

[2] Includes BLM's preferred tract delineation under Alternatives 2 and 3.

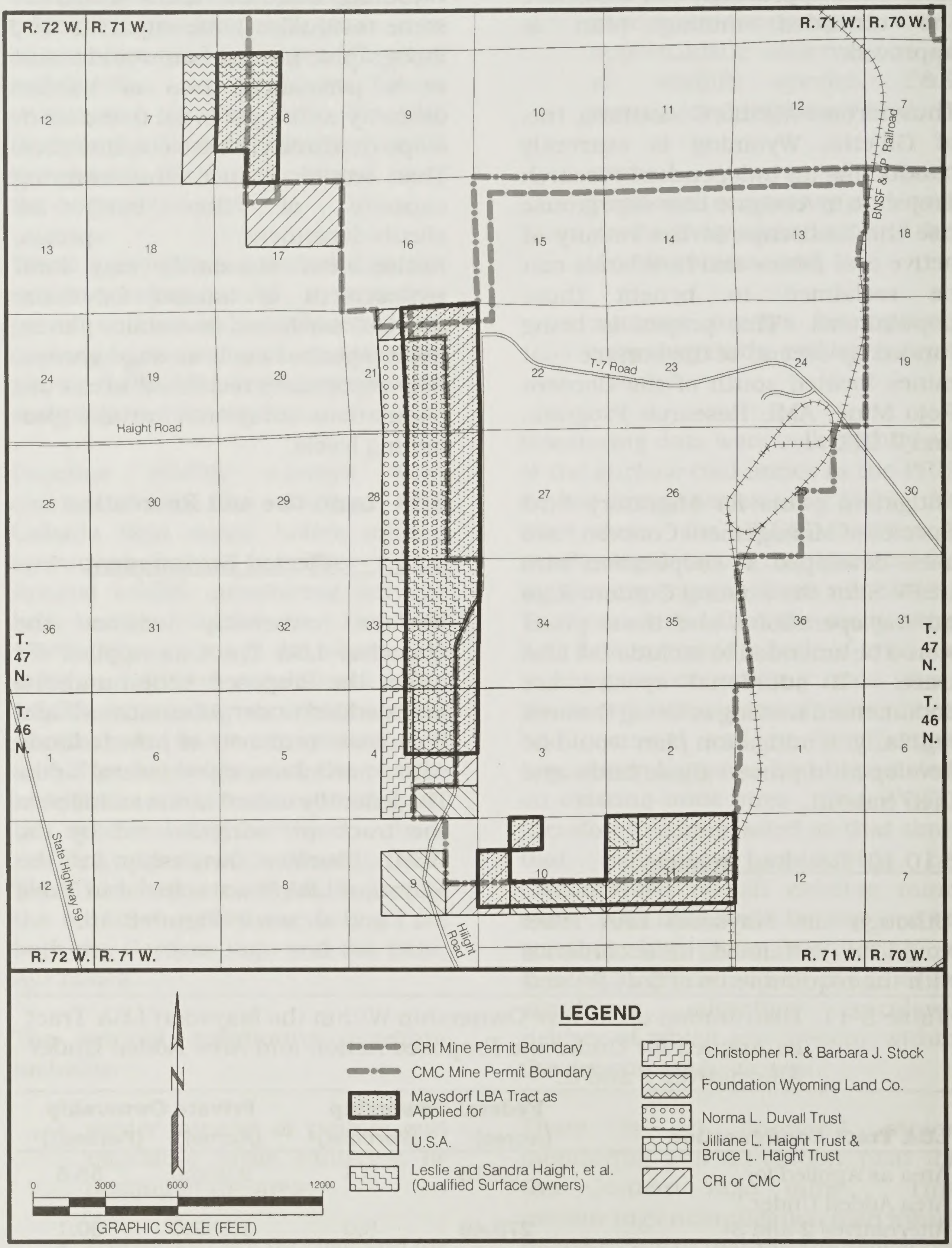

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
T. 47 N.
T. 46 N.
BNSF & UP Railroad
T-7 Road
Haight Road
State Highway 59
Hilight Road
LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Maysdorf LBA Tract as Applied for
U.S.A.
Leslie and Sandra Haight, et al. (Qualified Surface Owners)
Christopher R. & Barbara J. Stock
Foundation Wyoming Land Co.
Norma L. Duvall Trust
Jilliane L. Haight Trust & Bruce L. Haight Trust
CRI or CMC
N
0
3000
6000
12000
GRAPHIC SCALE (FEET)

Figure 3-16. Surface Ownership Within the Maysdorf LBA Tract.

The coal underlying the following lands is privately owned:

T.46N., R.71W.
Section 9: N½N½ and SE¼SE¼
Section 10: NE¼ SE¼NW¼ and NW¼NW¼

T.47N., R.71W.
Section 8: SW¼SW¼

These lands are not part of the Maysdorf LBA Tract and surface ownership for these lands is not shown on Figure 3-16.

The BLM has determined that one owner of surface lands included in the Maysdorf LBA Tract meets the requirements listed under 43 CFR 3400.0-5gg and is therefore considered to be a qualified surface owner. In the event that surface owner does not consent to leasing their land, which is located in the north half of Section 33, T.47N., R.71W., will be removed from the tract prior to holding a lease sale (Figure 3-16).

Livestock grazing on native rangeland is the primary land use, while oil and as production, wildlife habitat, and recreation are secondary land uses for both public and private lands.

Areas of disturbance within and near the proposed lease area include roads, oil and gas wells and associated production facilities, surface mine-related facilities, and activities associated with ranching. State Highway 59 is several miles west of the LBA tract. Several county roads traverse and provide public and private access within and near the proposed lease area. These include the Haight Road, T-7 Road, Hoadley Road, and the Hilight Road. The BNSF & UP railroad ROW also crosses a small portion of the tract.

The oil and gas estate within the Maysdorf LBA Tract is federally, privately, and state owned, with the majority (approximately 76 percent) being privately owned. All of the federally owned oil and gas estate is leased. The ownership of the oil and gas estate for the LBA tract is shown in Figure 3-17. A list of the current federal oil and gas lessees is given in Table 3-12.

According to the WOGCC records as of July 28, 2005, there were 18 permitted conventional oil and gas wells on lands included in the Maysdorf LBA Tract as proposed and the lands added under Alternatives 2 and 3 (Figure 3-17). Of these, 14 wells are plugged and abandoned, one well is shut in, one well is an active injector, and two wells are still producing. The two producing wells are on a private lease. All of the conventional oil and gas wells within the LBA tract configuration were originally drilled between 1979 and 1996.

The Supreme Court has ruled that the CBNG belongs to the owner of the oil and gas estate (98-830). Therefore, the oil and gas lessees have the right to develop CBNG as well as conventional oil and gas on the LBA tract.

According to the WOGCC records as of July 28, 2005, there were five CBNG wells that were producing, six

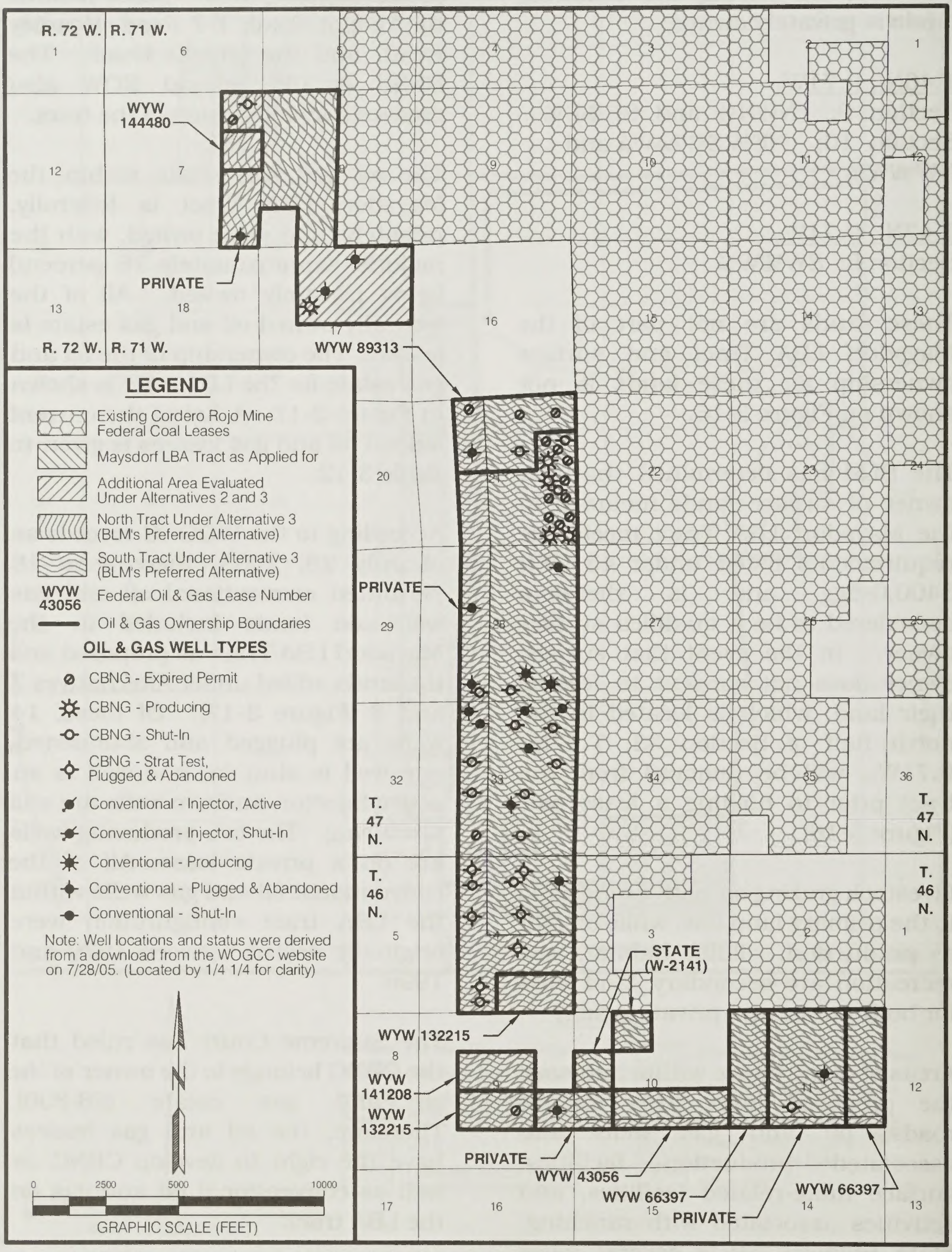

R. 72 W.
R. 71 W.
WYW 144480
PRIVATE
R. 72 W.
R. 71 W.
WYW 89313
LEGEND
Existing Cordero Rojo Mine Federal Coal Leases
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
WYW 43056
Federal Oil & Gas Lease Number
Oil & Gas Ownership Boundaries
OIL & GAS WELL TYPES
CBNG - Expired Permit
CBNG - Producing
CBNG - Shut-In
CBNG - Strat Test, Plugged & Abandoned
Conventional - Injector, Active
Conventional - Injector, Shut-In
Conventional - Producing
Conventional - Plugged & Abandoned
Conventional - Shut-In
Note: Well locations and status were derived from a download from the WOGCC website on 7/28/05. (Located by 1/4 1/4 for clarity)
0
2500
5000
10000
GRAPHIC SCALE (FEET)
PRIVATE
T. 47 N.
T. 46 N.
T. 47 N.
T. 46 N.
STATE (W-2141)
WYW 132215
WYW 141208
WYW 132215
PRIVATE
WYW 43056
WYW 66397
PRIVATE
WYW 66397
1
6
5
4
3
2
1
12
7
8
9
10
11
12
13
18
17
16
15
14
13
20
21
22
23
24
29
28
27
26
25
32
33
34
35
36
5
4
3
2
1
8
9
10
11
12
17
16
15
14
13

Figure 3-17. Oil and Gas Ownership Within the Maysdorf LBA Tract.

Table 3-12. Maysdorf LBA Tract Federal Oil and Gas Lessees of Record.

For the following locations, both the oil and gas rights (including CBNG) and coal rights are owned by the federal government.

Location	Lease Number	Lessees of Record
T.46N., R.71W.		
Section 4 Lots 19, 20 Section 9 Lots 4, 5	WYW 132215	Maurice W. Brown
Section 9 Lots 1, 2	WYW 141208	Maurice W. Brown
Section 10 Lots 3, 4, 5	WYW 043056	AG Andrikopoulos Res. Chaco Energy Co. Key Production Co. Nance Petroleum Corp.
Section 11 Lots 1, 4, 5, 8, 9, 12	WYW 066397	P&M Petro Management LLC. Key Production Co. Nance Petroleum Corp.
T.47N., R.71W.		
Section 7 Lots 5, 12	WYW 144480	Abo Petroleum Corp. Myco Industries Inc. Yates Drilling Co. Yates Petroleum Corp.
Section 21 Lots 1, 2, 3, 6, 7	WYW 089313	Club Oil & Gas Ltd. Dunway Investment Co. Electra Investment JWD III Inc. Raymond T. Duncan Oil Properties, Ltd. Walter Duncan Oil

Note: For the rest of the LBA tract, the oil and gas rights (including CBNG) are state or privately owned, and the coal rights are federally owned.

plugged and abandoned, and 17 were shut-in within the lands encompassed by the Maysdorf LBA Tract as proposed and the lands added under Alternatives 2 and 3 (Figure 3-17). Extensive CBNG development has occurred west of the tract. CBNG wells capable of production on or in sections adjacent to the Maysdorf LBA Tract are listed in Appendix G.

Additional information on the conventional oil and gas and CBNG development in the Maysdorf LBA Tract and surrounding area is included in Section 3.3.2.

Certain ancillary facilities are needed to support oil and gas production. These support facilities may include well access roads, well pads, production equipment at the wellhead (which may be located on the surface and/or underground), well production casing (which extends from the surface to the zone of production), underground pipelines (which gather the oil, gas, and/or water produced by the individual wells and carry it to a larger transmission pipeline or collection facility), facilities for treating, discharging, disposing of, containing, or injecting produced water, central metering facilities, electrical power utilities, gas compressor stations, and high-pressure transmission pipelines for delivering the gas to market. Currently, some of these oil and gas production facilities, particularly oil and gas pipelines, exist on the LBA tract, as discussed in Section 3.15 of this EIS. It is unlikely that additional support facilities will be constructed on the LBA tract because most of the conventional oil and gas and CBNG wells that exist on the tract have been either shut in or plugged and abandoned due to exhausted reserves and diminished production.

Coal mining is a dominant land use to the north, east, and southeast of the LBA tract. The Caballo, Belle Ayr, Cordero Rojo, and Coal Creek Mines form a group of contiguous or nearly contiguous surface coal mines located in Campbell County (Figure 1-1). The Coal Creek Mine was inactive between 2000 and 2006, but mining operations resumed in 2006. Coal production from these mines increased by 53 percent between 1994 and 2006 (from approximately 66 million tons in 1994 to 101 million tons in 2006). One lease, the West Rocky Butte lease, has been issued within this group of four mines since decertification of the federal coal region. The Maysdorf LBA Tract being evaluated in this EIS and the currently pending Belle Ayr North, Maysdorf II, and West Coal Creek lease applications are in this group of mines (Tables 1-1 and 1-2).

Campbell County does not have a county-wide land use plan, but has been working on a comprehensive land use plan jointly with the City of Gillette (City of Gillette 1978 and Campbell County 2005). The Gillette area land use plan is an integral part of the overall plan for Campbell County and recommends general types of uses for the area immediately surrounding the City of Gillette (City of Gillette 1978). The proposed lease area does not have a designated zoning classification. The *City of Gillette/Campbell County Comprehensive Planning Program* (City of Gillette 1978) provides general land use goals and policies for state and federal coal leases in the county.

Big game hunting is the principal recreational land use within the general analysis area, and pronghorn, mule deer, and white-tailed deer are present within the area (Section 3.10.2). On private lands, hunting is allowed only with landowner permission. Land ownership within the PRB is largely private (approximately 80 percent), with some private landowners permitting sportsmen to cross and/or hunt on their land. There has been a trend over the past two to three decades towards a substantial reduction in private lands that are open and reasonably available for hunting. Access fees continue to rise and many resident hunters feel these access fees are unreasonable. This trend has created problems for the WGFD in their attempt to distribute and control harvest at optimal levels, as well as for sportsmen who desire access to these animals (WGFD 2004).

In general, publicly owned lands (i.e., Forest Service or BLM-administered federal lands and state school sections) are open to hunting if legal access is available. Due to safety concerns, however, public surface lands contained within an active mining area are generally closed to the public, further limiting recreational use. There would be approximately 132 acres of BLM-administered public surface lands included in the Maysdorf LBA Tract as applied for and approximately 408 acres of BLM-administered public surface under Alternatives 2 and 3 (Figure 3-16). A maximum of 164 acres of the public surface are currently accessible to the public under any of the alternatives.

Specific details regarding big game herd management objectives within and near the general analysis area are contained in the *Casper* and *Sheridan Region Annual Big Game Herd Unit Reports* (WGFD 2004). The WGFD classifies the entire general analysis area as winter/yearlong habitat for antelope. No crucial or critical pronghorn habitat is recognized by the WGFD in this area (Note: WGFD definitions of big game ranges are included in Section 3.10.2.1). The proposed lease area is within pronghorn antelope Hunt Area 24, which is contained in the Hilight Herd Unit. In post-season 2003, the population of the Hilight Herd Unit was estimated to be approximately 11,416 animals, which is near the WGFD objective of 11,000 (WFGD 2004).

Historical problems associated with the management of the Hilight Herd Unit include hunter access, over harvest on limited public lands, and quantifying landowner preferences and desires. Prior to 1997, the herd population was fairly stable and near the objective of 11,000 antelope. Losses from severe winters, poor production rates, and disease subsequently decreased the population, but it has recently recovered and begun to stabilize near the objective level. Hunt Area 24 contains mostly privately owned surface lands with poor hunter access to limited publicly owned lands; therefore, the number of antelope is expected to steadily increase. If the population exceeds objective levels, more licenses will be needed and these may be difficult to sell in this mostly private land area. Nearly all landowners charge access fees for hunting and private land access is based on the desires and perceptions of the landowners. Increased harvest may be difficult to achieve because of the increased CBNG development, which is limiting rifle hunting on associated lands. Given the predicted harvest and average winter conditions, the 2004 post-season population was expected to be 12,180 antelope.

The WGFD has classified the majority of the general analysis area as yearlong mule deer use range. Crucial or critical mule deer habitat does not occur on or within several miles of the general analysis area. The proposed lease area is located within mule deer Hunt Area 21, part of the Thunder Basin Mule Deer Herd Unit, which also includes Hunt Areas 7, 8, 9, 10, and 11. The Thunder Basin Herd Unit encompasses 3,642 square miles, of this, 71 percent is privately owned. Access fees are common, resulting in heavy hunting pressure on accessible public lands, particularly in recent years. Between 1983 and 2001, the post-season objective for this mule deer herd was 13,000, but the population was consistently above that objective. The 2000 post-season population was estimated at 21,742, which was 67 percent above the objective. WGFD increased the objective to 20,000 head in December 2001. The 2003 postseason mule deer population was estimated at 19,299, which is near the herd objective. It is likely that insufficient harvest within Hunt Area 21 will result in a population increase in the future.

The Rochelle Hills Elk Herd resides in the Rochelle Hills located south of the general analysis area. A small portion of the general analysis area is within Elk Hunt Area 123 of the Rochelle Hills Herd Unit. The herd favors the ponderosa pine/juniper woodlands, savanna, and steeper terrain habitat offered by the Rochelle Hills. As more lands are reclaimed from coal mining adjacent to the Rochelle Hills, elk are shifting their winter use to those sites. Such lands typically offer excellent winter grass supplies, especially during more severe winters when other sites are less accessible. Elk have not been recently documented on the Maysdorf LBA Tract, although elk have been observed dispersing from the designated herd boundary. This dispersion is likely due to increasing population density and habitat limitations within the normal herd boundary. Elk may potentially expand into the Maysdorf study area in the future.

White-tailed deer are not managed separately by WGFD, but are included with mule deer as part of the Thunder Basin Herd Unit. White-tailed deer are seldom observed within the general analysis area due to their preference for riparian woodlands and irrigated agricultural lands. WGFD classifies the entire general analysis area, with the exception of a narrow corridor along the Belle Fourche River, as out of normal white-tailed deer use range. The narrow corridor along the Belle Fourche is classified as yearlong range.

Under natural conditions, aquatic habitat is very limited by the ephemeral nature of surface waters in the general analysis area; therefore, public fishing opportunities are very limited. The lack of deep-water habitat and extensive and persistent water sources limits the presence and diversity of fish and other aquatic species. However, water discharged from CBNG wells upstream of the general analysis area has supplied the Belle Fourche River with water nearly continuously, resulting in an increase in habitat for aquatic species. The Belle Fourche River currently supports a variety of nongame fish in the general analysis area (Section 3.10.6).

Sage grouse, mourning dove, waterfowl, rabbit, and coyote are hunted in the general vicinity, and some coyote and red fox trapping may occur.

3.11.2 Environmental Consequences

3.11.2.1 Proposed Action and Alternatives 2 and 3

The major adverse environmental consequences of leasing and mining the Maysdorf LBA Tract on land use would be the reduction of livestock grazing (cattle and sheep), loss of wildlife habitat (particularly big game), and curtailment of oil and gas development while the coal is being mined and during reclamation. This would include removal of all existing oil and gas surface and downhole production and transportation equipment and facilities. Wildlife and livestock use would be displaced while the tract is being mined and reclaimed. Grazing leases would be suspended on approximately 132 acres of federal lands if the Maysdorf LBA Tract were leased under the Proposed Action. Under Alternatives 2 and 3, access to approximately 408 acres of federal grazing leases would be suspended during mining operations. This federal land is within Grazing Allotment #22027, currently held by Dave Edwards (valid through July 2014) and Grazing Allotment #02349, currently held by Donald Wagensen and Doris Marquis (valid through January 2014). Access for recreational and other (i.e., ranching, oil and gas development) activities would be restricted during mining operations. Estimated disturbance areas for the Maysdorf LBA Tract and the tract configuration for Alternatives 2 and 3 are presented in Table 3-1.

Sections 3.3.2 and 3.11.1 and Appendix G of this document address producing, abandoned, and shut in oil and gas (conventional and CBNG) wells that presently exist on the LBA tract under the Proposed Action and Alternatives 2 and 3. Well location information, federal oil and gas ownership, and federal oil and gas lessee information are presented in Figure 3-17 and Table 3-12. BLM manages federal lands on a multiple use basis, in accordance with the regulations. In response to conflicts between oil and gas and coal lease holders, BLM policy advocates optimizing the recovery of both coal and CBNG resources to ensure that the public receives a reasonable return for these publicly owned resources. Optimal recovery of both coal and oil and gas resources requires negotiation and cooperation between the oil and gas lessees and the coal lessees. In the past, negotiations between some of the applicant mines and some of the existing oil and gas lessees have resulted in agreements that allow development of both resources in this area. Producing conventional oil and gas and CBNG wells are present on the Maysdorf LBA Tract. In the PRB, royalties have been and would be lost to both the state and federal governments if conventional oil and gas wells are abandoned prematurely, if the federal CBNG is not recovered prior to mining, or if federal coal is not recovered due to conflicts. State and federal governments can also lose bonus money when the costs of the agreements between the lessees are factored into the fair market value determinations.

Up to 408 acres of BLM-administered federal surface would be affected during mining operations if the Maysdorf LBA Tract is leased under the Proposed Action or Alternatives 2 or 3, but only about 164 of those acres are currently accessible by the public. The loss of access to federal lands is long term (during mining and reclamation), but is not permanent. Public access to federal lands would be restored after mining and reclamation are complete.

Hunting on the Maysdorf LBA Tract, including the federal surface discussed above, would be eliminated during mining and reclamation. Pronghorn and mule deer occur on and adjacent to the LBA tract, as do sage grouse, mourning dove, waterfowl, rabbit, and coyote. The federal lands actually represent a relatively small portion of the currently accessible public surface lands for recreational opportunity within the respective animal hunt areas.

Following reclamation, the land would be suitable for grazing and wildlife uses, which are the historic land uses. The reclamation standards required by SMCRA and Wyoming State Law meet the standards and guidelines for healthy rangelands for public lands administered by the BLM in Wyoming. Following reclamation bond release, management of the privately owned surface would revert to the private surface owner and management of the federally owned surface would revert to the federal surface managing agency (BLM).

3.11.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected, coal removal would not occur, and current land uses would continue on the 2,558.2 or 4,024.7 additional acres that would be disturbed under the Proposed Action or Alternatives 2 and 3, respectively. Currently approved mining operations would continue on the existing Cordero Rojo Mine leases. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.11.3. Regulatory Compliance, Mitigation and Monitoring

Mined areas would be reclaimed as specified in the approved mine plan to support the anticipated post-mining land uses of wildlife habitat and rangeland. The reclamation procedures would include stockpiling and replacing topsoil, using reclamation seed mixtures, which would be approved by WDEQ, and replacing stock reservoirs.

Steps to control invasion by weedy (invasive nonnative) plant species using chemical and mechanical methods would be included in the amended mine plan. (See discussion in Section 3.9.)

Revegetation growth and diversity would be monitored until the final reclamation bond is released (a minimum of 10 years following seeding with the final seed mixture). Erosion would be monitored to determine if there is a need for corrective action during establishment of vegetation. Controlled grazing would be used during revegetation to determine the suitability of the reclaimed land for anticipated post-mining land uses.

See Section 3.3.2.3 for discussion of regulatory requirements, mitigation and monitoring related to oil and gas development.

3.11.4 Residual Impacts

No residual impacts to land use and recreation are expected.

3.12 Cultural Resources

3.12.1 Affected Environment

Cultural resources, which are protected under the National Historic Preservation Act of 1966, are nonrenewable remains of past human activity. The PRB, including the general analysis area, appears to have been inhabited by aboriginal hunting and gathering people for more than 13,000 years. Throughout the prehistoric past, the area was used by highly mobile hunters and gatherers who exploited a wide variety of resources. Several thousand cultural sites have been recorded within the PRB.

Several culture historic chronologies are pertinent to evaluating prehistoric occupations in Wyoming. Frison's (1978, 1991) chronology for the Northwestern Plains divides occupations from early to late into the Paleoindian, Early Plains Archaic, Middle Plains Archaic, Late Plains Archaic, Late Prehistoric, and Protohistoric periods. Frison's chronology is listed below. The Plains designation within the Early, Middle, and Late Archaic periods has been omitted from this list:

- Paleoindian period (13,000 to 7,000 years B.P.)
- Early Archaic period (7,000 to 5,000-4,500 years B.P.)
- Middle Archaic period (5,000-4,500 to 3,000 years B.P.)
- Late Archaic period (3,000 to 1,850 years B.P.)
- Late Prehistoric period (1,850 to 400 years B.P.)
- Protohisto ric period (400 to 250 years B.P.)
- Historic period (250 to 120 years B.P.)

The Paleoindian period dates from about 13,000 to 7,000 years ago and includes various complexes (Frison 1978). Each of these complexes is correlated with a distinctive projectile point style derived from a general large lanceolate and/or stemmed point morphology. The Paleoindian period is traditionally thought to be synonymous with "big game hunters" who exploited megafauna such as bison and mammoth (plains Paleoindian groups), although evidence of the use of vegetal resources is noted at a few Paleoindian sites (foothill-mountain groups).

The Early Archaic period dates from about 7,000 to 5,000-4,500 years ago. Projectile point styles reflect the change from large lanceolate types that characterize the earlier Paleoindian complexes to large side- or corner-notched types. Subsistence patterns reflect exploitation of a broad spectrum of resources, with a much-diminished utilization of large mammals.

The onset of the Middle Archaic period (4,500 to 3,000 years B.P.) has been defined on the basis of the appearance of the McKean Complex as the predominant complex on the Northwestern Plains around 4,900 years B.P. (Frison 1978, 1991, 2001). McKean Complex projectile points are stemmed variants of the lanceolate point. These projectile point types continued until 3,100 years B.P. when they were replaced by a variety of large corner-notched points (i.e., Pelican Lake points) (Martin 1999). Sites dating to this period exhibit a new emphasis on plant procurement and processing.

The Late Archaic period (3,000 to 1,850 years B.P.) is generally defined by the appearance of corner-notched dart points. These projectile points dominate most assemblages until the introduction of the bow and arrow around 1,500 years B.P. (Frison 1991). The period witnessed a continual expansion of occupations into the interior grasslands and basins, as well as the foothills and mountains.

The Late Prehistoric period (1,850 to 400 years B.P.) is marked by a transition in projectile point technology around 1,500 years B.P. The large corner-notched dart points characteristic of the Late Archaic period are replaced by smaller corner- and side-notched points for use with the bow and arrow. Around approximately 1,000 years B.P., the entire Northwestern Plains appears to have suffered an abrupt collapse or shift in population (Frison 1991). This population shift appears to reflect a narrower subsistence base focused mainly on communal procurement of pronghorn and bison.

The Protohistoric period (400 to 250 years B.P.) witnesses the beginning of European influence on prehistoric cultures of the Northwestern Plains. Additions to the material culture include most notably the horse and European trade goods, including glass beads, metal, and firearms. Projectile points of this period include side-notched, tri-notched, and unnotched points, with the addition of metal points. The occupants appear to have practiced a highly mobile and unstable residential mobility strategy.

The historic period (250 to 120 years B.P.) is summarized from Schneider et al. (2000). The use of the Oregon Trail by emigrants migrating to the fertile lands of Oregon, California, and the Salt Lake Valley brought numerous pioneers through the state of Wyoming, but few stayed. It was not until the fertile land in the West became highly populated, along with the development of the cattle industry in the late 1860s, that the region currently comprising the state of Wyoming became attractive for settlement. The region offered cattlemen vast grazing land for the fattening of livestock, which could then be shipped across the country via the recently completed (1867-1868) transcontinental railroad in southern Wyoming.

The settling of the region surrounding Gillette, Wyoming began in the late 1800s, after a government treaty in 1876 placed the Sioux Indians on reservations outside the territory. Cattlemen were the first settlers to establish themselves in the area, with dryland farmers entering the area after 1900. The town of Gillette was established by the railroad in 1891 in an effort to promote the settling of undeveloped areas along their rail lines. The presence of the railroad allowed for the greater development of the cattle industry because it facilitated shipping cattle from the area. Several early ranches established in the region include the 4J Ranch (1875), Half Circle L Ranch (1880s), I Bar U Ranch (1888), and the T7 Ranch (1881). Early ranches established in the region surrounding the project area as of 1883 include the Ritchie Ranch, the McCray Ranch, and the 6 Ranch. Later arrivals to the area (as of 1908) include the Grant Ranch on Hay Creek, the Rooney Ranch on Rawhide Creek, and the Gardner and Wilson Ranches on the Little Powder River. The specific project area of Site 48CA3378 was homesteaded by George Oedekoven in 1917, and his family still maintains the property today.

A Class III cultural resources survey is an intensive and comprehensive inventory of a proposed project area conducted by professional archaeologists and consultants. The survey is designed to locate and identify all prehistoric and historic cultural properties 50 years and older that have exposed surface manifestations. The goal of the survey is to locate and evaluate for the NRHP all cultural resources within the project area. Cultural properties are recorded at a sufficient level to allow for evaluation for possible inclusion to the NRHP. Determinations of eligibility are made by the managing federal agency in consultation with the SHPO. Consultation with the SHPO must be completed prior to the approval of the mining plan.

After completion of a Class III cultural resources survey, additional investigations may be undertaken to complete an individual site record. If necessary, site-specific testing or limited excavation may be utilized to collect additional data which will: 1) determine the final evaluation status of a site; and/or 2) form the basis of additional work to be conducted during implementation of a treatment plan if the site is determined eligible for the NRHP. A treatment plan is then developed for those sites that are eligible for the NRHP and are within the area of potential effect. Treatment plans are implemented prior to mining and can include such mitigation measures as avoidance (if possible), large scale excavation, complete recording, Historical American Building Survey/Historic American Engineering Record documentation, archival research, and other acceptable scientific practices.

Data recovery plans are required for sites that are recommended as eligible for the NRHP and cannot be avoided by project development, following testing and consultation with the SHPO. Until consultation has occurred and agreement regarding NRHP eligibility has been reached, all sites recommended as eligible or undetermined eligibility must be protected from disturbance. Full consultation with the SHPO will be completed prior to approval of the mining plans. Those sites determined to be unevaluated or eligible for the NRHP through consultation would receive further protection or treatment.

Numerous Class I (survey records review) and Class III cultural resource surveys associated with oil and gas field development and surface mining operations have been conducted in the general area. CMC contracted with TRC Mariah Associates, Inc. of Laramie, Wyoming to perform Class I and Class III surveys of the Maysdorf LBA Tract and surrounding area in 2005. The 2005 survey covered the Maysdorf LBA Tract as applied for, the additional area evaluated under Alternatives 2 and 3, and the anticipated permit area if the Maysdorf LBA Tract is leased (Figure 3-1). This area is larger than the Maysdorf LBA Tract cultural survey area discussed below.

The Maysdorf LBA Tract cultural survey area refers to the anticipated area that would be disturbed in order to recover the coal in the LBA tract, which is comprised of the BLM study area (the LBA tract as applied for under the Proposed Action and the additional area evaluated under Alternatives 2 and 3) plus a ¼mile buffer.

The Maysdorf LBA Tract cultural survey area has been entirely surveyed for cultural resources at a Class III level. The Class I review of previous survey records identified 23 archeological sites, of which 13 are prehistoric, six are historic, and four are multi-component. Prehistoric sites consist primarily of open camps and lithic scatters. All prehistoric sites are considered not eligible or are unevaluated. Historic sites consist primarily of homesteads and trash dumps. Three historic trails (Hathaway's-Black Hills Trail, Sawyer's Expedition Trail, and Crook's Military Trail) were identified and all are considered eligible to the NRHP. The remaining three historic sites are considered not eligible. The four multi-component sites consist mostly of lithic and trash scatters and are considered not eligible. A total of 22 isolated occurrences were identified during the Class I records search. The isolates consist of 17 prehistoric flakes and tools, two historic debris items, and three unknown/unidentified finds.

The remainder of the Maysdorf LBA Tract cultural survey area was surveyed at a Class III level in 2005. A total of 16 archaeological sites and 28 isolated occurrences were identified and recorded during this recent Class III inventory. The 28 isolates consist of 26 prehistoric flakes and tools and two historic debris items. The 16 newly recorded cultural sites consist of 14 prehistoric (mostly lithic scatters) sites and two historic sites. One site (48CA5717), an open campsite, is considered eligible for the NRHP. All other newly recorded sites are recommended as not eligible. One previously recorded site (48CA1442) was updated during the inventory.

To summarize the identified cultural properties, a total of 39 archaeological sites are located in the Maysdorf LBA Tract cultural survey area. Of these 39 sites, 27 are prehistoric, eight are historic, and four are multi-component. Three historic trails (Hathaway's-Black Hills Trail, Sawyer's Expedition Trail, and Crook's Military Trail) and a prehistoric open campsite are the only sites considered eligible to the NRHP by the cultural site recorder. Three sites, Hathaway's-Black Hills Trail (48CA1568), Sawyer's Expedition Trail (48CA1570), and an open campsite (48CA5717), and their associated reports have not yet been concurred by SHPO. Site 48CA4975 (Crook's Military Trail) was concurred by SHPO in 2004. None of the other 35 archaeological sites are recommended as eligible or are unevaluated for the NRHP. Two historic and 26 prehistoric isolated finds were also recorded. Table 3-13 lists the cultural sites and their classifications.

Table 3-13. Sites and Isolated Finds in the Class III Cultural Resource Inventory of the Maysdorf LBA Tract Survey Area.

Prehistoric sites:	
Lithic Scatter:	48CA877, 48CA1332, 48CA1396, 48CA2599, 48CA2600, 48CA3286, 48CA3287, 48CA5625, 48CA5626, 48CA5627, 48CA5628, 48CA5629, 48CA5630, 48CA5633, 48CA5634
Open Campsite:	48CA69, 48CA879, 48CA880, 48CA1436, 48CA5631, 48CA5632, 48CA5686, 48CA5690, 48CA5716, 48CA5717
Stone Circle:	48CA1442
Campsite with Stone Circle:	48CA1438
Isolated finds:	43 lithic items
Historic sites:	
Trail:	48CA1568, 48CA1570, 48CA4975
Debris:	48CA2026, 48CA5601
Marker:	48CA3283
Livestock/Ranching:	48CA2025, 48CA5635
Isolated finds:	4 debris items
Multi-component sites:	48CA878, 48CA1343, 48CA1437, 48CA3285
Unknown/Unidentified Isolated Finds:	3 items

3.12.2 Environmental Consequences

3.12.2.1 Proposed Action and Alternatives 2 and 3

Data recovery plans are required for sites that are recommended eligible to the National Register and cannot be avoided by project development, following testing and consultation with the SHPO. Until consultation with SHPO has occurred and agreement regarding NRHP eligibility has been reached, all sites would be protected from disturbance.

Full consultation with SHPO must be completed prior to approval of the mining plans. At that time, those sites determined to be unevaluated or eligible for the NRHP through consultation would receive further protection or treatment. Impacts to eligible or unevaluated cultural resources cannot be permitted. If unevaluated sites cannot be avoided, they must be evaluated prior to disturbance. If eligible sites cannot be avoided, a data recovery plan must be implemented prior to disturbance. Ineligible properties may be destroyed without further work.

The eligible sites on the Maysdorf LBA Tract that cannot be avoided or that have not already been subjected to data recovery action would be carried forward in the mining and reclamation plan as requiring protective stipulations until a testing, mitigation, or data recovery plan is developed to address the impacts to the sites. The lead federal and state agencies would consult with Wyoming SHPO on the development of such plans and the manner in which they are carried out.

Cultural resources adjacent to the mine areas may be impacted as a result of increased access to the areas. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits outside of but adjacent to mine permit areas.

3.12.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal would not occur on the 2,558.2 or 4,024.7 additional acres that would be disturbed under the Proposed Action or Alternatives 2 and 3, respectively. Currently approved mining operations would continue on the existing Cordero Rojo Mine leases. Cultural resources on the portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be affected as a result of disturbance that would occur during recovery of the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.12.3 Native American Consultation

Native American heritage sites can be classified as prehistoric or historic. Some may be presently in use as offering, fasting, or vision quest sites. Other sites of cultural interest and importance may include rock art, stone circles, various rock features, fortifications or battle sites, burials, and locations that are sacred or part of the oral history and heritage but have no man-made features.

No Native American heritage, special interest, or sacred sites have been formally identified and recorded to date within the general analysis area. However, the geographic position of the general analysis area between mountains considered sacred by various Native American cultures (the Big Horn Mountains to the west, the Black Hills to the east, and Devils Tower to the north) creates the possibility that existing locations may have special religious or sacred significance to Native American groups. If such sites or localities are identified at a later date, appropriate action must be taken to address concerns related to those sites.

Tribes that have been identified as potentially having concerns about actions in the PRB include the Crow, Northern Cheyenne, Shoshone, Arapaho, Oglala Sioux, Rosebud Sioux, Crow Creek Sioux, Lower Brule Sioux, Standing Rock Sioux, Cheyenne River Sioux, Apache Tribe of Oklahoma, Comanche Tribe of Oklahoma, and Kiowa Tribe of Oklahoma. These tribal governments and representatives have been sent copies of the EIS and they have been provided with more specific information about the known cultural sites on the tract in this analysis and requested to identify potentially significant religious or cultural sites in the general analysis area before a leasing decision is made on the Maysdorf LBA Tract. Two tribes have expressed concerns or requested additional information, but have not identified specific sites that are of concern to their tribes at this time.

Native American tribes were consulted at a general level in 1995-1996 as part of an update to the BLM *Buffalo Resource Area RMP.* Some of the Sioux tribes were consulted by BLM on coal leasing and mining activity in the PRB at briefings held in Rapid City, South Dakota in March 2002.

3.12.4 Regulatory Compliance, Mitigation and Monitoring

Class I and III surveys are conducted to identify cultural properties on all lands affected by federal undertakings. Prior to any mining disturbance, SHPO is consulted to evaluate the eligibility of the cultural properties for inclusion in the NRHP. Cultural properties that are determined to be eligible for the NRHP would be avoided or, if avoidance is not possible, a recovery plan would be implemented prior to disturbance.

Through mitigation procedures involving data recovery plans at each site, the archaeological record will not be negatively affected due to the loss of sites 48CA1568, 48CA1570, 48CA4975, and 48CA5717. Archaeological excavation and analysis will provide information toward a better understanding of local historic sites to coal mining impacts.

Mining activities are monitored during topsoil stripping operations. If a lease is issued for the Maysdorf LBA Tract, BLM would attach a stipulation to the lease requiring the lessee to notify appropriate federal personnel if cultural materials are uncovered during mining operations (Appendix D).

3.12.5 Residual Impacts

Cultural sites that are determined to be eligible for the NRHP would be avoided if possible. Eligible sites that cannot be avoided would be destroyed by surface coal mining after data from those sites is recovered. Sites that are not eligible for the NRHP would be lost.

3.13 Visual Resources

3.13.1 Affected Environment

Visual sensitivity levels are determined by people's concern for what they see and the frequency of travel through an area. Landscapes within the general analysis area include rolling sagebrush and short-grass prairie, which are common throughout the PRB. There are also areas of altered landscape, such as oil fields and surface coal mines. The existing active surface mines that are located along the eastern side of the PRB form three geographic groups that are separated by areas with no mining operations. Two of the groups of surface mines are located east of Highway 59 from south of Gillette to south of Wright; the third mine group is located on the east side of U.S. Highway 14-16 from Gillette north for about 13 miles (Figure 1-1). Other man-made intrusions include ranching activities (fences, homesteads, and livestock), oil and gas development (pumpjacks, pipeline ROWs, CBNG well shelters, and CBNG compressor stations), transportation facilities (roads and railroads), environmental monitoring installations, road signage, and electrical power transmission lines. The natural scenic quality in and near the immediate lease area is fairly low because of the industrial nature of the adjacent existing mining operations and oil and gas development.

VRM guidelines for BLM lands are to manage public lands for current VRM classifications and guidelines. The VRM system is the basic tool used by BLM to inventory and manage visual resources on public lands. The VRM classes constitute a spectrum ranging from Class I through Class V that provides for increasing levels of change within the characteristic landscape.

For management purposes, BLM evaluated the visual resources on lands under its jurisdiction in the 2001 BLM Buffalo RMP update (BLM 2001a). The inventoried lands were classified into VRM classes. In the general analysis area, including the BLM-administered surface land, the predominant VRM class is Class IV for lands not yet disturbed by mining and Class V for lands that have already been disturbed by mining. For lands classified as VRM Class IV, activities, such as mining, attract attention and are dominant features of the landscape in terms of scale. Class V applies to areas where the natural character of the landscape has been disturbed up to a point where rehabilitation is needed to bring it up to the level of one of the other four classifications.

3.13.2 Environmental Consequences

3.13.2.1 Proposed Action and Alternatives 2 and 3

Much of the Maysdorf LBA Tract is visible from State Highway 59, which is two to three miles west of the tract. Therefore, some mining activities on the LBA tract would be visible from this major travel route.

If the Maysdorf LBA Tract is leased and mined, the portions of the general analysis area that would be disturbed under the Proposed Action or Alternatives 2 or 3 would be considered as VRM Class V prior to reclamation. After reclamation of the LBA tract and adjoining mines, the areas classified as Class V would improve to resemble the surrounding undisturbed terrain. No visual resources that are unique to this area have been identified on or near the Maysdorf LBA Tract.

Reclaimed terrain would be almost indistinguishable from the surrounding undisturbed terrain. Slopes might appear smoother (less intricately dissected) and gentler (less steep) than undisturbed terrain and sagebrush would not be as abundant for several years; however, within a few years after reclamation, the mined land would generally not be distinguishable from the surrounding undisturbed terrain except by someone very familiar with landforms and vegetation.

3.13.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal and associated disturbance and impacts would not occur on the 2,558.2 or 4,024.7 additional acres that would be disturbed under the Proposed Action or Alternatives 2 and 3, respectively, and the current VRM Class IV and V designations would not change for those lands. Currently approved mining operations would continue on the existing Cordero Rojo Mine leases. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.13.3 Regulatory Compliance, Mitigation and Monitoring

Landscape character would be restored during reclamation to approximate original contour and would be reseeded with an approved seed mixture, including native species.

See Section 3.2 and Section 3.9 for additional discussion of the regulatory requirements, mitigation, and monitoring for topography and vegetation.

3.13.4 Residual Impacts

No residual impacts to visual resources are expected.

3.14 Noise

3.14.1 Affected Environment

Existing noise sources in the general analysis area include coal mining activities, traffic on the nearby state highway and county roads, rail traffic, wind, and CBNG compressor stations. Noise originating from CBNG development equipment (e.g., drilling rigs and construction vehicles) is apparent locally over the short term (i.e., 30 to 60 days) where well drilling and associated construction activities are occurring. The amount of noise overlap between well sites is variable and depends on the timing of drilling activities on adjacent sites and the distance between the site locations.

Studies of background noise levels at PRB mines indicate that ambient sound levels generally are low, owing to the isolated nature of the area. The unit of measure used to represent sound pressure levels (decibels) using the A-weighted scale is a dBA. It is a measure designed to simulate human hearing by placing less emphasis on lower frequency noise because the human ear does not perceive sounds at low frequency in the same manner as sounds at higher frequencies. Figure 3-18 presents noise levels associated with some commonly heard sounds.

No site-specific noise level data are available for the proposed lease area. Because the Cordero Rojo Mine is adjacent to the proposed LBA tract, the current median noise level is estimated to be 40-60 dBA for day and night, with the noise level increasing with proximity to active mining operations at the adjacent mine. Mining activities are characterized by noise levels of 85-95 dBA at 50 ft from actual mining operations and activities (BLM 1992).

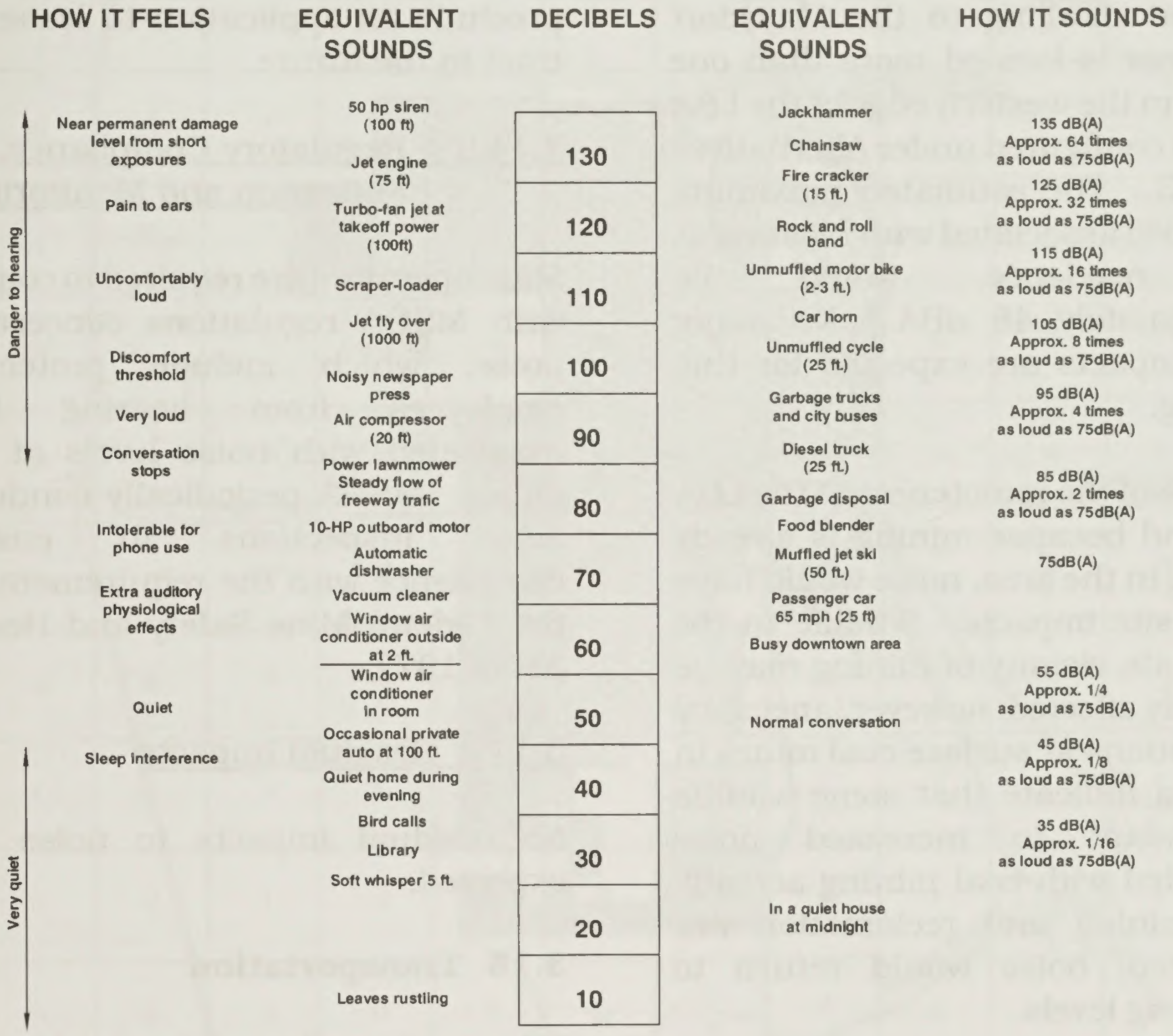
The nearest occupied dwellings to the Maysdorf LBA Tract include three residences located less than three miles from the LBA tract; the closest being approximately 6,600 ft from the western edge of the area added under Alternatives 2 and 3. Figure 3-8 depicts the locations of occupied residences with respect to the Maysdorf LBA Tract.

OSM prepared a noise impact report for the Caballo Rojo Mine (OSM 1980) that determined that the noise level from crushers and a conveyor would not exceed 45 dBA at a distance of 1,500 ft. The air overpressure created by blasting is estimated to be 123 dBA at the location of the blast. At a distance of approximately 2,500 ft (0.47 mile), the intensity of this blast would be reduced to 55 dBA (no adverse impact level).

3.14.2 Environmental Consequences

3.14.2.1 Proposed Action and Alternatives 2 and 3

Noise levels on the LBA tract would be increased considerably by mining activities such as blasting, loading, hauling, and possibly in-pit crushing. Since the LBA tract would be mined as an extension of existing operations under the Proposed Action or Alternatives 2 and 3, no rail car loading would take place on the LBA tract.


HOW IT FEELS
EQUIVALENT SOUNDS
DECIBELS
EQUIVALENT SOUNDS
HOW IT SOUNDS
Danger to hearing
Very quiet
Near permanent damage level from short exposures
Pain to ears
Uncomfortably loud
Discomfort threshold
Very loud
Conversation stops
Intolerable for phone use
Extra auditory physiological effects
Quiet
Sleep interference
50 hp siren (100 ft)
Jet engine (75 ft)
Turbo-fan jet at takeoff power (100ft)
Scraper-loader
Jet fly over (1000 ft)
Noisy newspaper press
Air compressor (20 ft)
Power lawnmower
Steady flow of freeway trafic
10-HP outboard motor
Automatic dishwasher
Vacuum cleaner
Window air conditioner outside at 2 ft.
Window air conditioner in room
Occasional private auto at 100 ft.
Quiet home during evening
Bird calls
Library
Soft whisper 5 ft.
Leaves rustling
130
120
110
100
90
80
70
60
50
40
30
20
10
Jackhammer
Chainsaw
Fire cracker (15 ft.)
Rock and roll band
Unmuffled motor bike (2-3 ft.)
Car horn
Unmuffled cycle (25 ft.)
Garbage trucks and city buses
Diesel truck (25 ft.)
Garbage disposal
Food blender
Muffled jet ski (50 ft.)
Passenger car 65 mph (25 ft)
Busy downtown area
Normal conversation
In a quiet house at midnight
135 dB(A) Approx. 64 times as loud as 75dB(A)
125 dB(A) Approx. 32 times as loud as 75dB(A)
115 dB(A) Approx. 16 times as loud as 75dB(A)
105 dB(A) Approx. 8 times as loud as 75dB(A)
95 dB(A) Approx. 4 times as loud as 75dB(A)
85 dB(A) Approx. 2 times as loud as 75dB(A)
75dB(A)
55 dB(A) Approx. 1/4 as loud as 75dB(A)
45 dB(A) Approx. 1/8 as loud as 75dB(A)
35 dB(A) Approx. 1/16 as loud as 75dB(A)

Adapted From ABC's of Our Noise Codes published by Citizens Against Noise, Honolulu, Hawaii

Figure 3-18. Relationship Between A-Scale Decibel Readings and Sounds of Daily Life.

The Noise Control Act of 1972 indicates that a 24-hour equivalent level of less than 70 dBA prevents hearing loss and that a level below 55 dBA, in general, does not constitute an adverse impact. The nearest occupied dwelling to the Maysdorf LBA Tract is located more than one mile from the western edge of the LBA tract as configured under Alternatives 2 and 3. The estimated maximum noise level associated with blasting at this residence would be approximately 48 dBA. No major noise impacts are expected for this dwelling.

Because of the remoteness of the LBA tract and because mining is already ongoing in the area, noise would have few off-site impacts. Wildlife in the immediate vicinity of mining may be adversely affected; however, anecdotal observations at surface coal mines in the area indicate that some wildlife may adapt to increased noise associated with coal mining activity. After mining and reclamation are completed, noise would return to premining levels.

3.14.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected; coal removal and the associated noise impacts would not occur on the 2,558.2 or 4,024.7 additional acres that would be disturbed under the Proposed Action or Alternatives 2 and 3, respectively. Currently approved mining operations and associated noise impacts would continue on the existing Cordero Rojo Mine leases. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.14.3 Regulatory Compliance, Mitigation and Monitoring

Mine operators are required to comply with MSHA regulations concerning noise, which include protecting employees from hearing loss associated with noise levels at the mines. MSHA periodically conducts mine inspections to ensure compliance with the requirements of the Federal Mine Safety and Health Act of 1977.

3.14.4 Residual Impacts

No residual impacts to noise are expected.

3.15 Transportation

3.15.1 Affected Environment

Transportation resources near the Maysdorf LBA Tract include State Highway 59, a number of improved, two-lane county roads (i.e., Haight Road, T-7 Road, Hilight Road, Hoadley Road, and Bishop Road), several unimproved local roads and accesses (unnamed two-track trails), the Gillette-Douglas rail spur used jointly by BNSF & UP Railroads, oil and gas pipelines, utility/power lines, telephone lines, and associated ROWs. Figure 3-19 depicts the current transportation facilities,

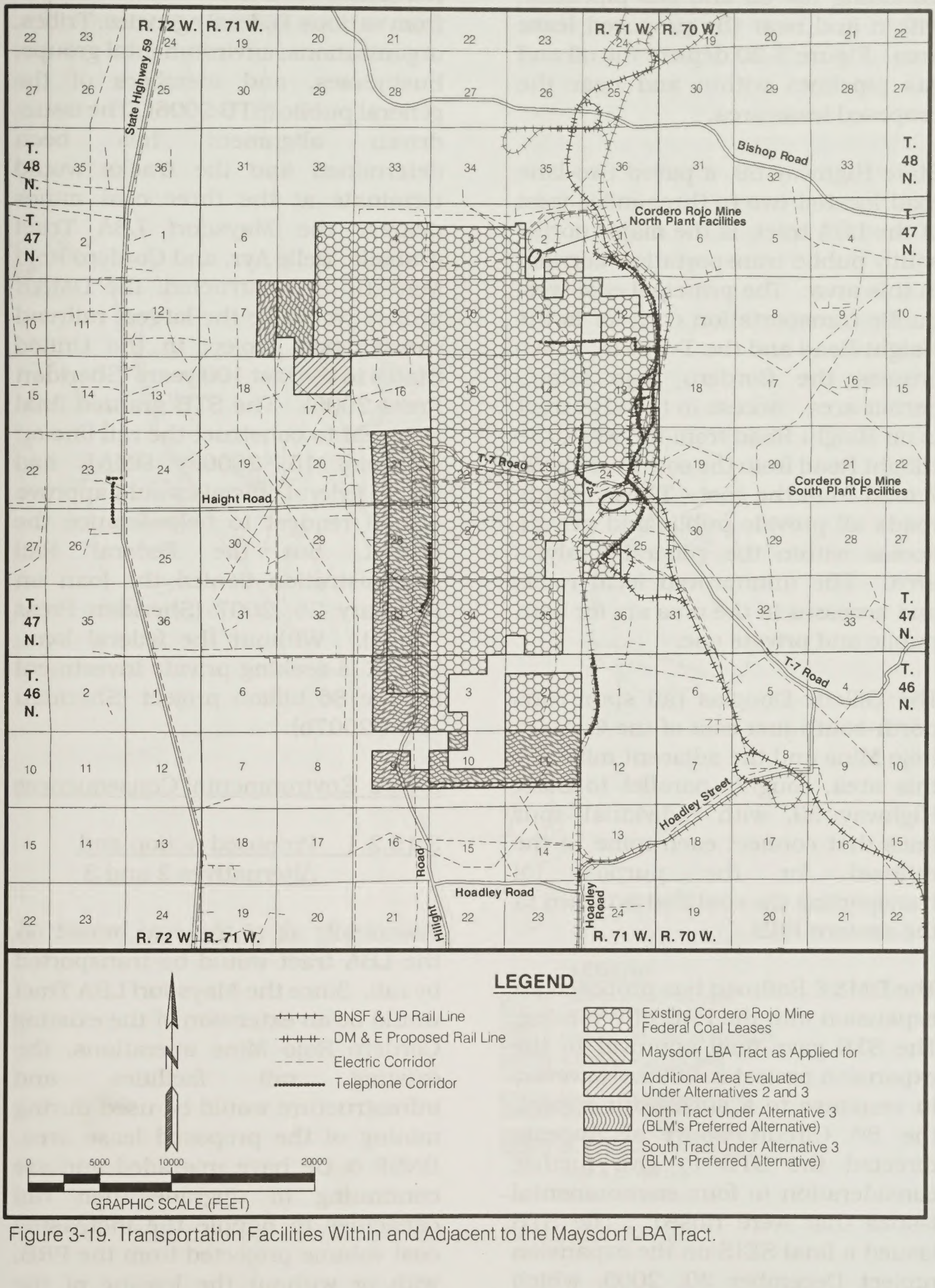

R. 72 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
State Highway 59
Bishop Road
Cordero Rojo Mine North Plant Facilities
Cordero Rojo Mine South Plant Facilities
T-7 Road
Haight Road
Hoadley Street
Hoadley Road
Hilight Road
LEGEND
BNSF & UP Rail Line
DM & E Proposed Rail Line
Electric Corridor
Telephone Corridor
Existing Cordero Rojo Mine Federal Coal Leases
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure 3-19. Transportation Facilities Within and Adjacent to the Maysdorf LBA Tract.

excluding the oil and gas pipelines, within and near the proposed lease area. Figure 3-20 depicts the oil and gas pipelines within and near the proposed lease area.

State Highway 59, a paved two-lane road located two to three miles west of the LBA tract, is the major north-south public transportation corridor in this area. The principal east-west public transportation corridor is the Haight Road and the T-7 road, which crosses the Cordero Rojo Mine's permit area. Access to the LBA tract is on Haight Road from the west, the Hilight Road from the south, or the T-7 road from the east. These county roads all provide public and private access within the general analysis area. The unimproved local roads and accesses in the area are for both public and private use.

The Gillette-Douglas rail spur runs north-south just east of the Cordero Rojo Mine and the adjacent mines in this area, roughly parallel to State Highway 59, with individual spur lines that connect each mine to the railroad for the purpose of transporting the coal that is mined in the eastern PRB.

The DM&E Railroad has proposed an expansion into the PRB of Wyoming. The STB gave final approval to the expansion project in 2002. However, in response to a successful appeal, the 8th Circuit Court of Appeals directed the STB to give further consideration to four environmental issues that were raised. The STB issued a final SEIS on the expansion project December 30, 2005, which addressed the four issues that were remanded back to the STB with input from various Federal agencies, Tribes, organizations, environmental groups, businesses, and members of the general public (STB 2006). The issue-driven alignment has been determined and the tracks would terminate at the three coal mines nearest the Maysdorf LBA Tract (Caballo, Belle Ayr, and Cordero Rojo Mines). If constructed, the DM&E project would be the largest railroad construction project in the United States in the last 100 years (Sheridan Press 2006). The STB granted final approval to construct the rail line on February 15, 2006. DM&E had hoped federal officials would approve a loan request to help finance the project, but the Federal Rail Administration denied the loan on February 26, 2007 (Sheridan Press 2007a). Without the federal loan, DM&E is seeking private investment for the $6 billion project (Sheridan Press 2007b).

3.15.2 Environmental Consequences

3.15.2.1 Proposed Action and Alternatives 2 and 3

Essentially all of the coal mined on the LBA tract would be transported by rail. Since the Maysdorf LBA Tract would be an extension of the existing Cordero Rojo Mine operations, the existing rail facilities and infrastructure would be used during mining of the proposed lease area. BNSF & UP have upgraded and are continuing to upgrade their rail capacities to handle the increasing coal volume projected from the PRB, with or without the leasing of the proposed Maysdorf LBA Tract. The

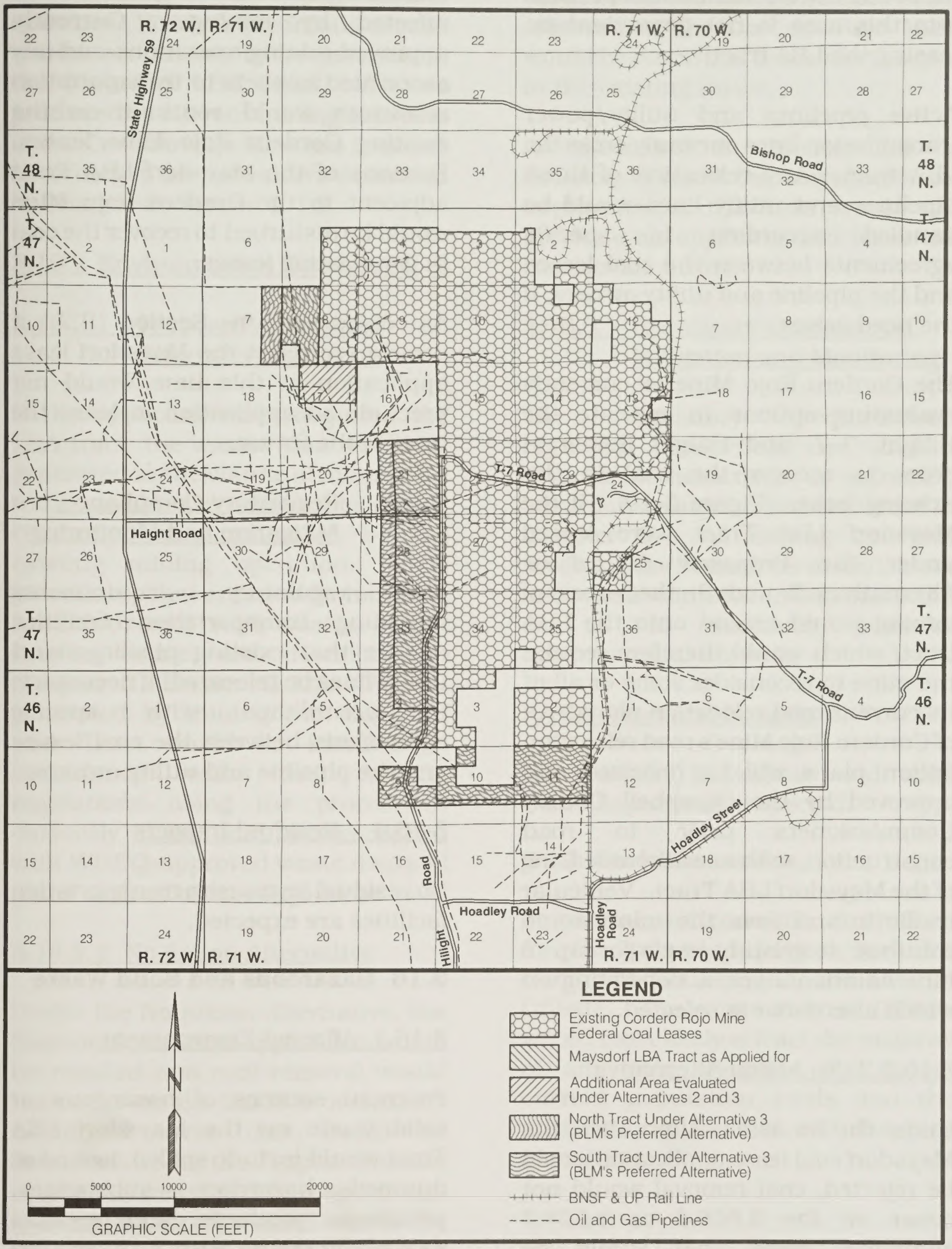

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
State Highway 59
Bishop Road
T-7 Road
Haight Road
Hoadley Street
Hoadley Road
Hilight Road
LEGEND
Existing Cordero Rojo Mine Federal Coal Leases
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
BNSF & UP Rail Line
Oil and Gas Pipelines
N
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure 3-20. Oil and Gas Pipelines Within and Adjacent to the Maysdorf LBA Tract

proposed DM&E Railroad expansion into this area is not dependent on leasing the LBA tract.

Active pipelines and utility/power transmission lines currently cross the LBA tract. Any relocation of these pipelines and utility lines would be handled according to specific agreements between the coal lessee and the pipeline and utility owners, if the need arises.

The Cordero Rojo Mine is currently evaluating options to relocate the Hilight, T-7, and Haight Roads in order to recover the coal in the existing leases (Figure 3-19). If the Maysdorf LBA Tract were leased under the Proposed Action or Alternatives 2 and 3, the areas of mining would extend onto the LBA tract, which would therefore require the mine to reconsider some or all of its current road relocation plans. All of Cordero Rojo Mine's road relocation option plans will be reviewed and approved by the Campbell County Commissioners prior to road construction, with or without leasing of the Maysdorf LBA Tract. Vehicular traffic to and from the mine would continue at existing levels for up to nine additional years, depending on which alternative is selected.

3.15.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected, coal removal would not occur on the 2,558.2 or 4,024.7 additional acres that would be disturbed under the Proposed Action or Alternatives 2 and 3, respectively, and the transportation resources located in those areas would not be affected by mining. Currently approved mining operations and any associated impacts to transportation resources would continue on the existing Cordero Rojo Mine leases. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.15.3 Regulatory Compliance, Mitigation and Monitoring

The regulatory requirements regarding transportation facilities require that existing pipelines and utility lines be relocated, if necessary, in accordance with specific agreements between the coal lessee and the pipeline and utility owners.

3.15.4 Residual Impacts

No residual impacts to transportation facilities are expected.

3.16 Hazardous and Solid Waste

3.16.1 Affected Environment

Potential sources of hazardous or solid waste on the Maysdorf LBA Tract would include spilled, leaked or dumped hazardous substances, petroleum products, and/or solid waste associated with coal and oil and gas exploration, oil and gas development, the BNSF & UP railroad, utility line installation and maintenance, or agricultural activities. No such hazardous or solid wastes are known to be present on the Maysdorf LBA Tract. Wastes produced by current mining activities at the Cordero Rojo Mine are handled according to the procedures described in Chapter 2, Section 2.1.2.

3.16.2 Environmental Consequences

3.16.2.1 Proposed Action and Alternatives 2 and 3

If the applicant mine acquires the LBA tract, the wastes that would be generated in the course of mining the tract would be similar to those currently being generated by the existing mining operation. The procedures that are used for handling hazardous and solid wastes at the existing mine are described in Chapter 2, Section 2.1.2. Wastes generated by mining the Maysdorf LBA Tract would be handled in accordance with the existing regulations using the procedures currently in use and in accordance with WDEQ-approved waste disposal plans at the Cordero Rojo Mine.

3.16.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and coal removal would not occur on the 2,558.2 or 4,024.7 additional acres that would be disturbed under the Proposed Action or Alternatives 2 and 3, respectively, and no waste materials would be generated as a result of coal removal on the tract. Currently approved mining operations would continue on the existing Cordero Rojo Mine leases. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.16.3 Regulatory Compliance, Mitigation and Monitoring

The regulatory requirements regarding production, use, and/or disposal of hazardous or extremely hazardous materials are discussed in Chapter 2. All mining activities involving the hazardous materials are and would continue to be conducted so as to minimize potential environmental impacts.

3.16.4 Residual Impacts

No residual hazardous and solid waste impacts are expected.

3.17 Socioeconomics

The social and economic study area for the proposed project includes Campbell County and the City of Gillette. The community of Gillette would most likely attract the majority of any new residents due to its current population levels and the availability of services and shopping amenities.

3.17.1 Local Economy

3.17.1.1 Affected Environment

Wyoming's coal mines produced 404.49 million tons in 2005, according to the Wyoming State Inspector of Mines. This was an increase of 2.2 percent over the 395.7 million tons produced in the state in 2004. PRB coal production (from 13 active mines in Campbell and Converse Counties) was over 390 million tons in 2005, which represented more than 96 percent of the state coal production.

In the fourth quarter of 2003, 29 percent of the total employment and 44 percent of the total payroll in Campbell County were attributed to the mining sector, which also includes oil and gas employment (Wyoming Department of Employment 2005b). In 2004, Campbell County employment grew faster than the statewide average, adding 731 jobs (3.5 percent increase). Job growth occurred in construction, manufacturing, and local government, but the most dramatic increase was in the mining sector (Wyoming Department of Employment 2005c).

In 2004 and 2005, BLM held competitive sealed-bid lease sales for six coal tracts (NARO South, West Antelope, West Hay Creek, Little Thunder, West Roundup, and NARO North). As a result, the greatest source of revenue to the state and federal governments from federal coal in 2004 and 2005 was lease bonus bids. Bonus bids are paid to the federal government for the right to enter into lease agreements for federal coal. They are paid in five annual installments; the state receives half of each installment.

The successful bonus bids for the six lease sales held in 2004 and 2005 ranged from 30 cents per ton to 97 cents per ton and totaled $1.69 billion (BLM 2006b). Annual bonus bid payments from the six lease sales total $338.2 million. Combined with remaining bonus bid payments from lease sales held in previous years of $90.1 million, the annual bonus bid payment total for 2004 was $428.3 million, derived directly from federal coal in Campbell and Converse Counties.

Wyoming, Campbell County and the cities and towns in the county receive revenue from a variety of taxes and royalties on the production of federal coal in addition to the bonus bids. These include ad valorum taxes, severance taxes, royalty payments, and sales and use taxes and required contributions to the AML program and the Black Lung Disability Trust Fund.

The royalties are collected by the federal government at the time the coal is sold and equal 12.5 percent of the sale price. Royalty and bonus bids are divided equally with the State of Wyoming, while half of Wyoming's AML contributions are earmarked for later use in the state. Additional sources of revenue include federal income tax and annual rentals that are paid to the government.

Sales and use taxes are distributed to cities and towns within the county and to the county's general fund. According to the Excise Tax Division of the Wyoming Department of Revenue (2004), the sales and use taxes collected from coal mines and coal mining-related services in Campbell County in FY 2004 was $8.2 million.

In 1994, the University of Wyoming estimated that the total fiscal benefit to the State of Wyoming for coal produced in the PRB was $1.10 per ton (Borden et al. 1994). This study did not include AML fees or bonus bid payments in the calculation for fiscal benefits to the State of Wyoming. Calculating the estimated total fiscal benefit to the State of Wyoming in 2005 by including half of the bonus bid payments, half of the federal mineral royalties based on current prices, half of the AML fees, and all of the ad valorum taxes, severance taxes, and sales and use taxes for coal produced in Campbell County in 2004 results in an estimated $620 million, or $1.53 per ton. Figure 3-21 depicts the estimated total revenues to state and federal governments from 2004 coal production in Campbell County.

Recent GDP calculations for Wyoming (2002) indicate that the minerals industry accounted for 22 percent of the GDP, which made it the largest sector of the Wyoming economy. Mining alone accounted for 8.7 percent of the Wyoming GDP (Wyoming Department of Administration and Information 2005).

3.17.1.2 Environmental Consequences

3.17.1.2.1 Proposed Action and Alternatives 2 and 3

The federal and state revenues that would be generated by the leasing and mining of the Maysdorf LBA Tract would depend on which alternative is selected and the sale price of the coal. Coal prices increased in 2005, generally as a result of concerns over coal transportation and stockpile issues, but declined in 2006. According to the WSGS, the average spot price of 8,400 Btu coal in the PRB in the second half of 2005 was $11.06 per ton, compared with an average spot price during the first half of 2005 of $7.29 per ton and an average spot price of $4.93 per ton the year before (WSGS 2006). Average spot prices for 8,400 Btu coal declined to $9.17 per ton in the first half of 2006 (WSGS 2007). The Wyoming Consensus Revenue Estimating Group is forecasting that the average gross sales prices for Wyoming coal production will range from $8.51 to $9.20 per ton from 2006 through 2010 (Wyoming CREG 2006). PRB prices are generally lower than prices for coal produced in other areas of Wyoming, however, most of the coal produced in Wyoming is from the PRB. For the purposes of this EIS, a conservative average price of $5.80 per ton is estimated for the coal included in the Maysdorf LBA Tract, which has an average Btu value of a little over 8,400.

Using the coal tonnages shown in Table 3-1, projected federal and state revenues for the Maysdorf LBA Tract

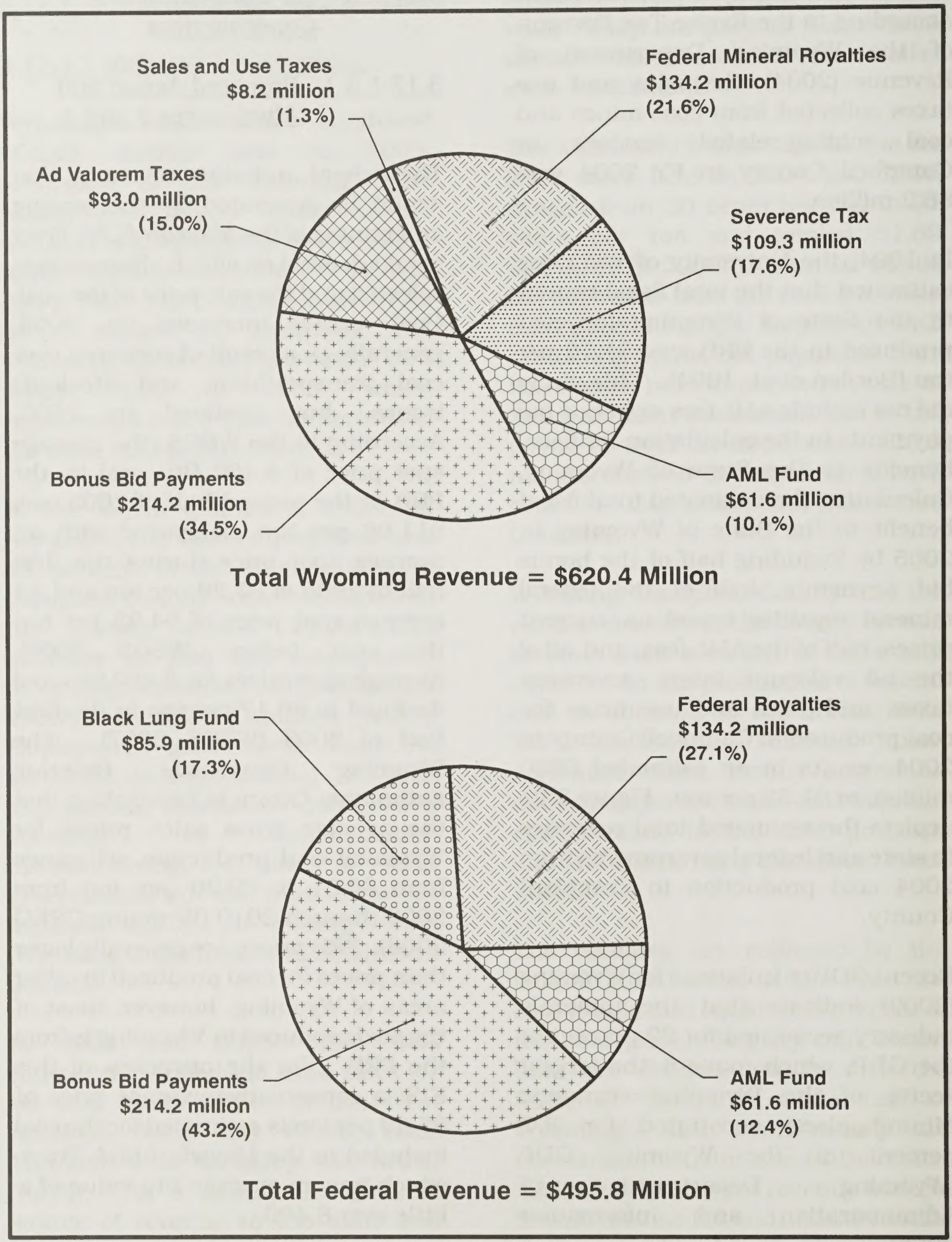


Figure 3-21. Estimated Wyoming and Federal Revenues from 2004 Coal Production in Campbell County.

are presented in Table 3-14, assuming an average coal price of $5.80 per ton recovered and a potential range of bonus payments on the leased (minable) coal of 30 to 97 cents per ton.

If the Maysdorf LBA Tract is leased and mined under the Proposed Action, the potential additional federal revenues would range from approximately $201 to $278 million. Under Alternatives 2 and 3, potential additional federal revenues would range from approximately $295 million to $408 million.

If the LBA tract is leased and mined under the Proposed Action, the potential additional state revenues would range from about $279 to $357 million. Under Alternatives 2 and 3, potential additional state revenues would range from about $410 to $523 million.

The base of economic activity provided by wages and local purchases would continue for up to nine additional years, depending on which alternative is selected.

3.17.1.2.2 No Action Alternative

Under the No Action Alternative, the potentially recoverable coal included in the LBA tract under the Proposed Action (216.5 million tons) or Alternatives 2 and 3 (317.6 million tons) would not be mined and the economic benefits associated with mining that coal would not be realized by the state or federal government. Currently approved mining operations and associated economic benefits would continue on the existing Cordero Rojo Mine leases. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.17.2 Population

3.17.2.1 Affected Environment

Campbell County had a population of 33,698 in 2000, an estimated population of 36,240 in 2003, and an

Table 3-14. Projected Socioeconomic Impacts from Leasing the Maysdorf LBA Tract Under the Proposed Action or Alternatives 2 and 3.

Item	No Action Alternative (Existing Cordero Rojo Mine)	Proposed Action	Alternatives 2 and 3
State Revenues	$ 412.5 mm	$ 691.9 to $ 769.0 mm	$ 822.3 to $ 935.5 mm
Federal Revenues	$ 280.7 mm	$ 481.9 to $ 559.0 mm	$ 575.8 to $ 689.0 mm
Increased Mine Life	0 yrs	6 yrs	9 yrs
Additional Employees	0	20	52

estimated population of 37,816 in 2004. This represents a 12.2 percent growth rate since 2000 and makes Campbell County the second fastest growing county in the state. Campbell County's population ranks it as the fourth largest of Wyoming's 23 counties and Gillette is the fourth largest city in the state, following only Cheyenne, Casper, and Laramie (USDOC 2000, CCEDC 2006, and Wyoming Department of Administration and Information 2005).

Gillette's population totaled 17,054 in 1987 and, according to census data, by 2000 Gillette's population was 19,646 and Wright's population was 1,347. Between 1990 and 2000, Gillette grew by 2,011 persons, averaging 1.1 percent per year. From December 2001 through December 2006, the population of Gillette increased from 22,867 to 27,533 (City of Gillette 2007). Wright had an average growth rate of 0.9 percent during the period from 1990 and 2000. In 2003, Gillette accounted for 21,840, or 60 percent, of the county's residents (USDOC 1990 and 2000 and Wyoming Department of Administration and Information 2005).

3.17.2.2 Environmental Consequences

3.17.2.2.1 Proposed Action and Alternatives 2 and 3

As indicated by Table 3-14, leasing and subsequently mining the LBA tract would extend the life of the Cordero Rojo Mine, and current employment at the mine, by up to nine additional years, depending on which alternative is selected. Average yearly employment at the mine would increase by up to 52 positions under the Proposed Action and Alternatives 2 and 3 (Table 2-2). It is likely that the additional employees would be available from the existing workforce in Campbell County and no influx of new residents would occur as a result of filling these new positions.

3.17.2.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and the coal included in the LBA Tract under the Proposed Action or Alternatives 2 and 3 would not be mined. Population levels would not be affected by any additional employment at the Cordero Rojo Mine. Currently approved mining operations and associated employment levels would continue on the existing Cordero Rojo Mine leases for approximately nine years.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.17.3 Employment

3.17.3.1 Affected Environment

Coal mining has changed a great deal since the 1970s, and new technologies have been a major contributor to these changes. The local coal mining labor force grew during the 1970s. Between 1980 and 1998, overall production rose while employee numbers generally decreased or remained constant. The employment declines followed large industry capital investments in facilities and production equipment, the majority of which were aimed at increasing productivity. Direct employment in Campbell County at coal mines increased from 3,011 to 4,168 between 1998 and 2005 (Wyoming Department of Employment 1998 and 2005a).

The mining sector, which includes oil and gas workers, accounts for almost 28 percent of all employment in Campbell County, nearly four times the statewide percentage.

In 2005, around 6,007 people were directly employed by surface coal mines or coal contractors in Campbell County, representing about 25 percent of the employed labor force (Wyoming Department of Employment 2005a). Campbell County also has slightly higher percentages of construction and wholesale trade employment, which is keeping with the development demands of continuing growth and the county's position as a commercial center for northeast Wyoming.

3.17.3.2 Environmental Consequences

3.17.3.2.1 Proposed Action and Alternatives 2 and 3

Leasing and subsequently mining the Maysdorf LBA Tract would extend the life of the Cordero Rojo Mine by up to nine additional years, depending on which alternative is selected. As discussed above, average yearly employment at the mine would increase by up to 52 positions under the Proposed Action and Alternatives 2 and 3 (Table 2-2). In July 2005, the unemployment rate in Campbell County was 2.7 percent (641 persons) (Wyoming Department of Employment 2005d). It is likely that additional employees would be available from the existing workforce in Campbell County, depending on the timing of the hiring at the mine as compared to the timing of hiring for other ongoing and proposed projects in the county, which are discussed in Section 4.1. The economic stability of the community of Gillette would benefit by having the current Cordero Rojo Mine workforce living in the community and employed at the mine for up to nine additional years.

3.17.3.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and the coal included in the Maysdorf LBA Tract under the Proposed Action or Alternatives 2 and 3 would not be mined. Mine life and existing employment levels would not be extended for up to nine additional years, and any increase in employees associated with mining the coal in the tract would not occur. Currently approved mining operations and associated employment would continue on the existing Cordero Rojo Mine leases for approximately nine years. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.17.4 Housing

3.17.4.1 Affected Environment

According to a 2001 report on housing needs in Campbell County, roughly 61 percent of PRB surface coal mining employees live in Gillette and surrounding areas, 14 percent live in Wright, and 25 percent live outside of Campbell County (BLM 2003a).

There were 11,538 housing units in Campbell County reported in the 1990 census. The 2000 census counted 13,288 housing units in Campbell County, of which 12,207 were occupied at the time. There were 8,989 (73.6 percent) owner occupied units and 3,218 (26.4 percent) occupied rental units (U.S. Census Bureau 2000).

The number of housing units in Gillette increased from 7,078 in 1990 to 7,931 in 2000, an increase of 12 percent. According to the City of Gillette, the housing stock in Gillette increased to 10,194 at the end of December 2006 (City of Gillette 2007). The number of units added in unincorporated, rural areas of Campbell County is not known because the county does not require building permits or certificates of occupancy for residential development in unincorporated areas (Braunlin 2004).

The types of housing units counted in 2000 included 6,698 single-family detached units, 794 single-family attached units, 2,276 multi-family units, 3,432 mobile homes, and 88 RVs, vans, or similar types of units. Subsequent construction added 561 single-family detached, 61 single-family attached, 498 manufactured homes, and 352 multi-family units in Gillette and Wright, plus an unknown number of single-family and manufactured units in rural areas. The resulting totals are estimated at 7,259 single-family detached units (49.2 percent), 855 single-family attached units (5.8 percent), 2,628 multi-family units (17.8 percent), 3,930 mobile/manufactured units (26.6 percent), and 88 RV/vans (0.6 percent) (CSI 2005).

The overall vacancy rate in Campbell County in 1990 was 13.6 percent, although the homeowner vacancy rate was just 3.6 percent while rental vacancies were at 19.4 percent (U.S. Census Bureau 1990). By 2000, the overall vacancy rate in the county had dropped to 8.1 percent with the rate for rental units at 9.0 percent and the rate for owner units at 1.2 percent (U.S. Census Bureau 2000). Due to the population growth that has recently occurred in association with CBNG development, the housing vacancy rate within the City of Gillette has continued to decrease. A survey conducted in October 2004 estimated the vacancy rate of rental units to be 7.0 percent, based on a sample of approximately 40 percent of all rental units, mostly in larger complexes (CSI 2005). According to the City of Gillette, there was a 0.15 percent vacancy rate for rental property in 2006, while the average annual vacancy rate for manufactured home/mobile home rentals within the city limits was 9.05 percent (City of Gillette 2007). Many apartments had waiting lists.

The average selling price of a house in Campbell County was $133,482 in 2002. Prices tend to be lowest in Wright and highest in unincorporated areas, with the City of Gillette in between. Average selling prices in the first three quarters of 2004 ranged from $78,189 for a manufactured home in Gillette to $230,601 for a site-built home in rural Campbell County (CSI 2005).

An October 2004 survey found average apartment rents ranging from $363 per month for an efficiency apartment to $572 per month for a three-bedroom unit (CSI 2005). In the fourth quarter of 2003, average rent for a house in Campbell County was $707 and the average rent for a mobile home was $590 (Wyoming Department of Administration and Information 2005).

In addition to permanent housing, temporary or transient housing is a consideration for any project that might have a construction component. Temporary housing can include hotels or motels, campgrounds, and possibly mobile home parks.

There are 17 motels in Gillette with 1,346 guest rooms, one additional 27-room motel in Wright and a two-room bed & breakfast in Gillette. Hotel occupancy rates have recently been very high and several new hotels are proposed for construction (Gillette News Record, 2006a). Gillette has two year-round commercial campgrounds with 150 hookups for RVs plus tent areas (Gillette Convention and Visitor's Bureau 2004). Campbell County has a multi-event facility, the CAM-PLEX, located in Gillette. It has 1,821 RV sites, which vary from 688 full service sites with rest rooms and shower facilities to electric only sites. The CAM-PLEX facilities are generally available only for scheduled special events, not for public camping (CAM-PLEX 2005).

Gillette also has approximately 1,595 mobile home park spaces. Mobile home parks are generally considered permanent housing resources, but they sometimes provide temporary spaces for RVs as well if there are vacant spaces available. As of early October 2004, the average vacancy rate in Gillette's mobile home parks was 35 percent, or 558 spaces (CSI 2005).

3.17.4.2 Environmental Consequences

3.17.4.2.1 Proposed Action and Alternatives 2 and 3

As discussed above, average yearly employment at the mine would increase by up to 52 positions and employment at the mine would be extended by up to nine additional years, under the Proposed Action and Alternatives 2 and 3. No additional demands on the existing infrastructure or services in the community would be expected because little or no influx of new residents would be needed to fill new jobs. Although housing is tight in Gillette, it is likely that housing for the additional employees would be available from the existing and proposed units in Campbell County.

3.17.4.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and the coal included in the Maysdorf LBA Tract under the Proposed Action or Alternatives 2 and 3 would not be mined. Housing occupancy would not be affected by any additional employment at the Cordero Rojo Mine. Currently approved mining operations and associated employment levels would continue on the existing Cordero Rojo Mine leases for approximately nine years. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.17.5 Local Government Facilities and Services

3.17.5.1 Affected Environment

The availability of revenues generated by mineral production has helped local government facilities and services keep pace with growth and are adequate for the current population.

Campbell County School District No. 1's 2005 enrollment was stable at 7,500 students, making it the third largest school district in Wyoming. Enrollment has increased since the end of the 2005-2006 school year and some schools are becoming more crowded (Gillette News Record 2006b). The district facilities include: one high school (with two campuses) and two junior high schools in Gillette, a junior-senior high school in Wright and 15 elementary schools (including one in Wright and four in rural areas). The district also operates an alternative high school and aquatic center in Gillette (CCSD 2005).

The Campbell County Sheriff provides police protection throughout the county, except within the City of Gillette. In addition to general law enforcement, the Sheriff's staff provides court security, detention facilities, and animal control. For the 2004 fiscal year, the department budgeted for 60 law enforcement employees. Recent improvements have increased the Campbell County detention facility to 128 beds, which includes separate modules for women and juveniles (BLM 2005b).

Fire protection throughout Campbell County is provided by the Campbell County Fire Department, which is governed by a city-county joint powers board (Vonsik 2005). The department maintains four stations in Gillette and six dispersed throughout the county. The department has 17 full-time staff and 150 trained volunteers. In addition, there are 30 to 40 volunteers in outlying areas who are trained and equipped primarily to fight wildland fires. Campbell County coal mines generally provide equipment and trained staff to fight fires on mine property. The County Fire

Department provides backup assistance with personnel and equipment (Vonsik 2005).

The primary medical care facility in Campbell County is Campbell County Memorial Hospital, a 90-bed acute care hospital. The hospital has a medical staff of over 50 affiliated physicians in 20 specialties and a total staff of 800 (CCMH 2005). The hospital also operates the Wright Clinic, a satellite clinic with a full-time, family practice physician. Ambulance service for Campbell County is provided by the hospital, which has a 24-hour emergency service capability. The Campbell County Fire Department provides first responder service to emergency calls, but transport is the responsibility of the hospital affiliated ambulance service (Vonsik 2005).

Water and wastewater treatment systems are provided by the City of Gillette and by the Wright Water and Sewer District. Gillette serves the city and some urbanized areas nearby from groundwater wells. The water system has the capacity to serve approximately 25,000 people. Water use approaches capacity during the summer months when parks and private lawns are being irrigated (Morovits 2005). An additional well field is being planned for completion in about five years. In the interim, the city has other wells it can pump if necessary, but high natural fluoride levels require careful monitoring if they are used (Morovits 2005). Gillette's sewer treatment system was designed for a service population of approximately 35,000 and improvements begun in the fall of 2004 were designed to increase treatment capacity to accommodate a projected population of 41,000. Currently, the system serves an estimated 25,000 people in the city and surrounding areas. The Wright district's water and sewage treatment facilities were designed to serve a population of approximately 3,000, albeit with an additional sewage lagoon required when the service population reached about 2,500 people. The district is planning an additional well to increase its water supply capacity by about 30 percent. The district facilities in Wright currently serve a population of approximately 1,400 people; essentially the entire town is hooked on to the water system and most lots are on the sewer system unless they have private septic systems.

3.17.5.2 Environmental Consequences

3.17.5.2.1 Proposed Action and Alternatives 2 and 3

As discussed above, average yearly employment at the mine would increase by up to 52 positions and mine life would be extended by up to nine additional years under the Proposed Action and Alternatives 2 and 3. No additional demands on the existing community facilities or services in the county would be expected because little or no influx of new residents would be needed to fill new jobs. It is likely that the demand for public facilities and services will be satisfied by the existing facilities and services currently in place in Campbell County.

3.17.5.2.2 No Action Alternative

Under the No Action Alternative, the Maysdorf coal lease application would be rejected and the coal included in the Maysdorf LBA Tract under the Proposed Action or Alternatives 2 and 3 would not be mined. Local government facilities and services would not be affected by any additional employment at the Cordero Rojo Mine. Currently approved mining operations and associated employment levels would continue on the existing Cordero Rojo Mine leases for approximately nine years. Portions of the Maysdorf LBA Tract adjacent to the Cordero Rojo Mine would be disturbed to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Maysdorf lease application at this time would not preclude an application to lease the tract in the future.

3.17.6 Environmental Justice

3.17.6.1 Affected Environment

Environmental Justice issues are concerned with actions that unequally impact a given segment of society either as a result of physical location, perception, design, noise, or other factors. On February 11, 1994, Executive Order 12898, “Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations”, was published in the *Federal Register* (59 FR 7629). The Executive Order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level). The Executive Order makes it clear that its provisions apply fully to Native American populations and Native American tribes, specifically to effects on tribal lands, treaty rights, trust responsibilities, and the health and environment of Native American communities.

Communities within Campbell County, entities with interests in the area, and individuals with ties to the area all may have concerns about the presence of surface coal mines in the area. Environmental Justice concerns are usually directly associated with impacts on the natural and physical environment, but these impacts are likely to be interrelated with social and economic impacts as well. Native American access to cultural and religious sites may fall under the umbrella of Environmental Justice concerns if the sites are on tribal lands or access to a specific location has been granted by treaty right.

Compliance with Executive Order 12898 concerning Environmental Justice was accomplished through opportunities for the public to receive information on this EIS in conjunction with consultation and coordination described in Section 1.6 of this document. This EIS and contributing socioeconomic analysis provide a consideration of the impacts with regard to disproportionately adverse impacts on minority and/or low-income groups, including Native Americans.

3.17.6.2 Environmental Consequences

3.17.6.2.1 Proposed Action and Alternatives 2 and 3

Economic and demographic data indicate that neither minority populations nor people living at or below the poverty level make up "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole, or that they would be unequally impacted if the Maysdorf LBA Tract is leased under the Proposed Action or Alternatives 2 or 3. Also, the Native American population is smaller than in the state as a whole and there are no known Native American sacred sites on or near the proposed LBA site. Consequently, implementation of the proposed project would not adversely affect the environmental justice considerations in the area.

3.17.6.2.2 No Action Alternative

Economic and demographic data indicate that neither minority populations nor people living at or below the poverty level make up "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole, or that they would be unequally impacted if the Maysdorf LBA Tract is leased under the Proposed Action or Alternatives 2 or 3. Also, the Native American population is smaller than in the state as a whole and there are no known Native American sacred sites on or near the existing Cordero Rojo Mine. Consequently, the No Action Alternative would not adversely affect the environmental justice considerations in the area.

3.17.7 Regulatory Compliance, Mitigation and Monitoring

Surface coal mines are required to pay royalty and taxes as required by federal, state, and local regulations. The BLM compares the amount of coal reported as produced with the estimated amount of coal in the ground to verify that the federal coal is efficiently mined and that royalties are paid on all of the coal that is mined.

3.17.8 Residual Effects

No socioeconomic residual impacts are expected.

3.18 The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

From 2006 on, the Cordero Rojo Mine would be able to produce coal at an average production level of 40 mmtpy for another nine years under Alternative 1 (No Action Alternative), compared with an average of 40 mmtpy for 15 years under the Proposed Action, or an average of 40 mmtpy for another 18 years under Alternatives 2 and 3 (Table 2-2).

As the coal is mined, almost all components of the present ecological system, which have developed over a long period of time, would be modified. In partial consequence, the reclaimed land would be topographically lower, and although it would resemble original contours, it would lack some of the original diversity of geometric form.

The forage and associated grazing and wildlife habitat that the LBA tract provides would be temporarily lost during mining and reclamation. During mining of the LBA tract there would be a loss of native vegetation on 2,558 acres (Proposed Action) up to a maximum of 4,025 acres (Alternatives 2 and 3) with an accompanying disturbance of wildlife habitat and grazing land. This disturbance would occur incrementally over a period of years. The mine site would be returned to equivalent or better forage production capacity for domestic livestock before the performance bond is released. Long-term productivity would depend largely on postmining range-management practices, which to a large extent would be controlled by private landowners.

Mining would disturb pronghorn and sage grouse nesting habitat. There would be loss and displacement of wildlife during mining, but it is anticipated that reclaimed habitat would support a diversity of wildlife species similar to premining conditions. The diversity of species found in undisturbed rangeland would not be completely restored on the leased lands for an estimated 50 years after the initiation of disturbance. Re-establishment of mature sagebrush habitat, which is crucial for pronghorn and sage grouse, would be expected to take even longer.

CBNG is currently being recovered from within and/or near the LBA tract and BLM's analysis suggests that a large portion of the CBNG resources on the tract has been recovered or would be recovered prior to mining. CBNG that is not recovered prior to mining would be vented to the atmosphere during the mining process. CBNG is composed primarily of methane, which is a greenhouse gas that contributes to global warming. According to the Energy Information Administration (USDOE 2005a):

- U.S. anthropogenic methane emissions totaled 26.6 million metric tons in 2005.
- U.S. 2005 methane emissions from coal mining were estimated at 2.85 million metric tons, which represents approximately 10.7 percent of the U.S. total anthropogenic methane emissions in 2005.
- Methane emissions from surface coal mining in the U.S. were estimated at about 0.54 million metric tons in 2005, which represents approximately 2.03 percent of the estimated U.S. anthropogenic methane emissions in 2005.

Approximately 51.3 percent of the coal mined using surface mining techniques in the U.S. in 2005 came from the Wyoming PRB (USDOE

2005b), which means that Wyoming PRB surface coal mines were responsible for approximately 1.04 percent of the estimated U.S. anthropogenic methane emissions in 2005.

Total U.S. methane emissions attributable to coal mining would not be likely to decrease if the Maysdorf LBA Tract is not leased at this time because a decision to lease or not to lease the tract would not directly affect total U.S. coal production. However, the methane on an LBA tract could be more completely recovered if leasing is delayed.

Coal is a major source of electricity generation in the U.S. Approximately 51.1 percent of electric power in the U.S. is provided by coal (USDOE 2005b). Coal-fired power plant emissions include greenhouse gasses that contribute to global warming. According to the Energy Information Administration (USDOE 2005a):

- CO_2 emissions represent about 84 percent of the total U.S. greenhouse gas emissions.

- Estimated CO_2 emissions in the U.S. totaled 6,008.6 million metric tons in 2005, which was 0.3 percent more than 2004.

- Estimated CO_2 emissions from the electric power sector totaled 2,375.0 million metric tons, or about 40 percent of total U.S. energy-related CO_2 emissions in 2005.

- Estimated CO_2 emissions from coal electric power generation in 2005 totaled 1,994.2 million metric tons or about 33 percent of total U.S. energy-related CO_2 emissions in 2005.

The Wyoming PRB produced about 37.6 percent of the coal used for power generation in the U.S. in 2005, which means that Wyoming PRB surface coal mines were responsible for approximately 12.5 percent of the estimated U.S. CO_2 emissions in 2005. The applicant mine plans to produce the coal included in the LBA tract at currently permitted levels using existing production and transportation facilities. As a result, leasing the Maysdorf LBA Tract to an existing mine under the Proposed Action or Alternatives 2 and 3 would not be expected to result in new emissions of CO_2 from coal-fired power plants.

Coal also releases mercury into the air when it is burned. Mercury in the air settles into water or onto land, where it can be washed into the water. Certain microorganisms can change it into methyl mercury, which is a highly toxic mercury compound that builds up in fish and shellfish when they feed. There are adverse health effects to both humans and other animals who consume these fish and shellfish. Research has shown that most people's fish consumption does not cause a health concern, but high levels of methyl mercury in the bloodstream of unborn babies and young children may harm the developing nervous systems of those children (EPA 2006c). According to the EPA, coal-fired power plants are the largest remaining source of human-generated mercury emissions in the U.S., accounting for more than 40 percent of all domestic human-caused mercury emission; however, these emissions contribute very little to the global mercury pool. EPA estimates that mercury emissions from U.S. coal-fired power plants account for about one percent of the global total (EPA 2007). As indicated above, the Wyoming PRB produced about 37.6 percent of the coal used for power generation in the U.S. in 2005, which would represent less than 0.4 percent of the global mercury emissions. As indicated previously, the Cordero Rojo Mine plans to produce the coal included in the LBA tract at currently permitted levels using existing production and transportation facilities. As a result, leasing the Maysdorf LBA Tract under the Proposed Action or Alternatives 2 and 3 would not be expected to result in new emissions of mercury from coal-fired power plants.

If the Maysdorf LBA Tract is leased and mined, there would be a deterioration of the groundwater quality in the lease area; however, the water quality would still be adequate for livestock and wildlife. This deterioration would probably occur over a long period of time. As a result of mining alone, depth to groundwater would increase in an area extending roughly six miles west of the Cordero Rojo Mine pits in the coal aquifer. The water levels in the coal aquifer should return to premining levels at some time after mining has ceased, as discussed in Section 3.5.4, because recharge areas would not be disturbed in order to recover the coal in the LBA tract.

Mining operations and associated activities would degrade the air quality and visual resources of the area on a short-term basis. Following coal removal, removal of surface facilities, and completion of reclamation, there would be no long-term impact on air quality. The long-term impact on visual resources would be minor.

Short-term impacts to recreation values may occur from reduction in big game populations due to habitat disturbance and reduction in access to some public lands. These changes would primarily impact hunting in the lease area. However, because reclamation would result in a wildlife habitat similar to that which presently exists and access to public lands would be restored, there should be no long-term adverse impacts on recreation.

The long-term economy of the region would be enhanced as a result of the Proposed Action and Alternatives 2 and 3. The Proposed Action and Alternatives 2 and 3 would extend the life of the Cordero Rojo Mine from six to nine years (Table 2-1).

3.19 Irreversible and Irretrievable Commitments of Resources

The major commitment of resources would be the mining and consumption of 216.5 million tons (Proposed Action) up to a maximum of 317.6 million tons (Alternatives 2 and 3) of coal to be used for electrical power generation. CBNG that is not recovered prior to mining would also be irreversibly and irretrievably lost (see additional discussion of the impacts of venting CBNG to the atmosphere in Section 3.18). It is estimated that one to two percent of the energy produced would be required to mine the coal, and this energy would also be irretrievably lost.

The quality of topsoil on approximately 2,558 acres (Proposed Action) up to a maximum of approximately 4,025 acres (Alternatives 2 and 3) would be irreversibly changed. Soil formation processes, although continuing, would be irreversibly altered during mining-related activities. Newly formed soil material would be unlike that in the natural landscape.

Direct and indirect wildlife deaths caused by mining operations or associated activity would be an irreversible loss.

Loss of life may conceivably occur due to the mining operations and vehicular and train traffic. On the basis of surface coal mine accident rates in Wyoming as determined by the Mine Safety and Health Administration (1997) for the 10-year period 1987-1996, fatal accidents (excluding contractors) occur at the rate of 0.003 per 200,000 man-hours worked. Disabling (lost-time) injuries occur at the rate of 1.46 per 200,000 man-hours worked. Any injury or loss of life would be an irretrievable commitment of human resources.

Disturbance of all known historic and prehistoric sites on the mine area would be mitigated to the maximum extent possible. However, accidental destruction of presently unknown archeological or paleontological values would be irreversible and irretrievable.

4.0 CUMULATIVE ENVIRONMENTAL CONSEQUENCES

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

This section summarizes the cumulative impacts that are occurring as a result of existing development in the PRB[1] and considers how those impacts would change if other projected development in the area occurs and if the Maysdorf LBA Tract is leased and mined.

BLM completed three regional EISs evaluating the potential cumulative impacts of surface coal development in the 1970s and early 1980s (BLM 1974, 1979, and 1981). A draft document for a fourth regional EIS was prepared and released in 1984 (BLM 1984). Since those regional EISs were prepared, BLM has prepared a number of NEPA analyses evaluating coal leasing actions and oil and gas development in the PRB. Each of these NEPA analyses includes an analysis of cumulative impacts in the Wyoming PRB.

The BLM is completing a regional technical study, called the PRB Coal Review, to help evaluate the cumulative impacts of coal and other mineral development in the PRB. The PRB Coal Review consists of three tasks:

- Task 1 identifies current resource conditions in the PRB and, for applicable resources, updates the BLM's 1996 status check for coal development in the PRB. The baseline year for the Task 1 evaluation of the current conditions is 2003.

- Task 2 defines the past and present development activities in the PRB and their associated development levels as of 2003 and develops a forecast of reasonably foreseeable development in the PRB through 2020. The reasonably foreseeable activities fall into three broad categories: coal development (coal mine and coal-related), oil and gas development (conventional oil and gas, CBNG, and major transportation pipelines), and other development, which includes development that is not energy-related as well as other energy-related development.

- Task 3 predicts the cumulative impacts that could be expected to occur to air, water, socioeconomic, and other resources if the development occurs as projected in the forecast developed under Task 2.

A series of reports has been prepared to present the results of the PRB Coal Review task studies. The Task

---

[1] Refer to page xv for a list of abbreviations and acronyms used in this document.

1, 2, and 3 reports represent components of a technical study of cumulative development in the PRB; they do not evaluate specific proposed projects, but they provide information that BLM is using to evaluate the cumulative impacts that would be expected to occur if specific projects or applications, such as the Maysdorf coal lease application, are approved. The Task 1 reports, which include air quality conditions, water resources conditions, social/economic conditions, and other resource conditions, and the Task 2 reports have been completed. The Task 3 reports for air quality conditions, social/economic conditions, and other resource conditions have been completed. The Task 3 evaluation of water resource conditions is in progress. The information in these reports is summarized later in this chapter, and the completed reports are available from the BLM offices in Casper and Cheyenne and on the Wyoming BLM website at http://www.wy.blm.gov/minerals/coal/prb/prbdocs.htm.

The PRB includes portions of northeastern Wyoming and southeastern Montana. The Wyoming portion of the PRB is the primary focus of the PRB Coal Review reports. The Montana portion of the PRB is included in the Task 2 report and in the Task 1 and 3 air resources studies. For the majority of resources in the Task 1 report and for the Task 2 report, the Wyoming portion of the PRB Coal Review study area encompasses all of Campbell County, all of Sheridan and Johnson Counties outside of the Bighorn National Forest, and the northern portion of Converse County (Figure 4-1). For some components of the Task 2 report and for the Task 1 and 3 air resource studies, the Montana PRB Coal Review study area includes portions of Big Horn, Custer, Powder River, Rosebud, and Treasure Counties. For several resources, the Task 1 and Task 3 study areas include only potentially affected portions of the Wyoming PRB Coal Review study area; for other resources, the study area extends outside of Wyoming and Montana because the impacts would extend beyond the PRB. For example, the groundwater drawdown is evaluated in the area surrounding and extending west of the mines, because that is the area where surface coal mining operations would impact groundwater resources; but air quality impacts are evaluated over a multi-state area because they would be expected to extend beyond the PRB.

Section 4.1 summarizes the information presented in the PRB Coal Review Task 1 and Task 2 reports. Section 4.2 summarizes the predicted cumulative impacts to air, water, socioeconomic, and other resources presented in the PRB Coal Review Task 3 reports.

4.1 Past, Present, and Reasonably Foreseeable Development

Past, present, and reasonably foreseeable development in the Wyoming PRB are considered in the Task 1 and Task 2 reports for the PRB Coal Review. The Task 1 reports describe the current situation, which reflects the past and present levels of development. The Task 2 report defines the past and present development activities in the

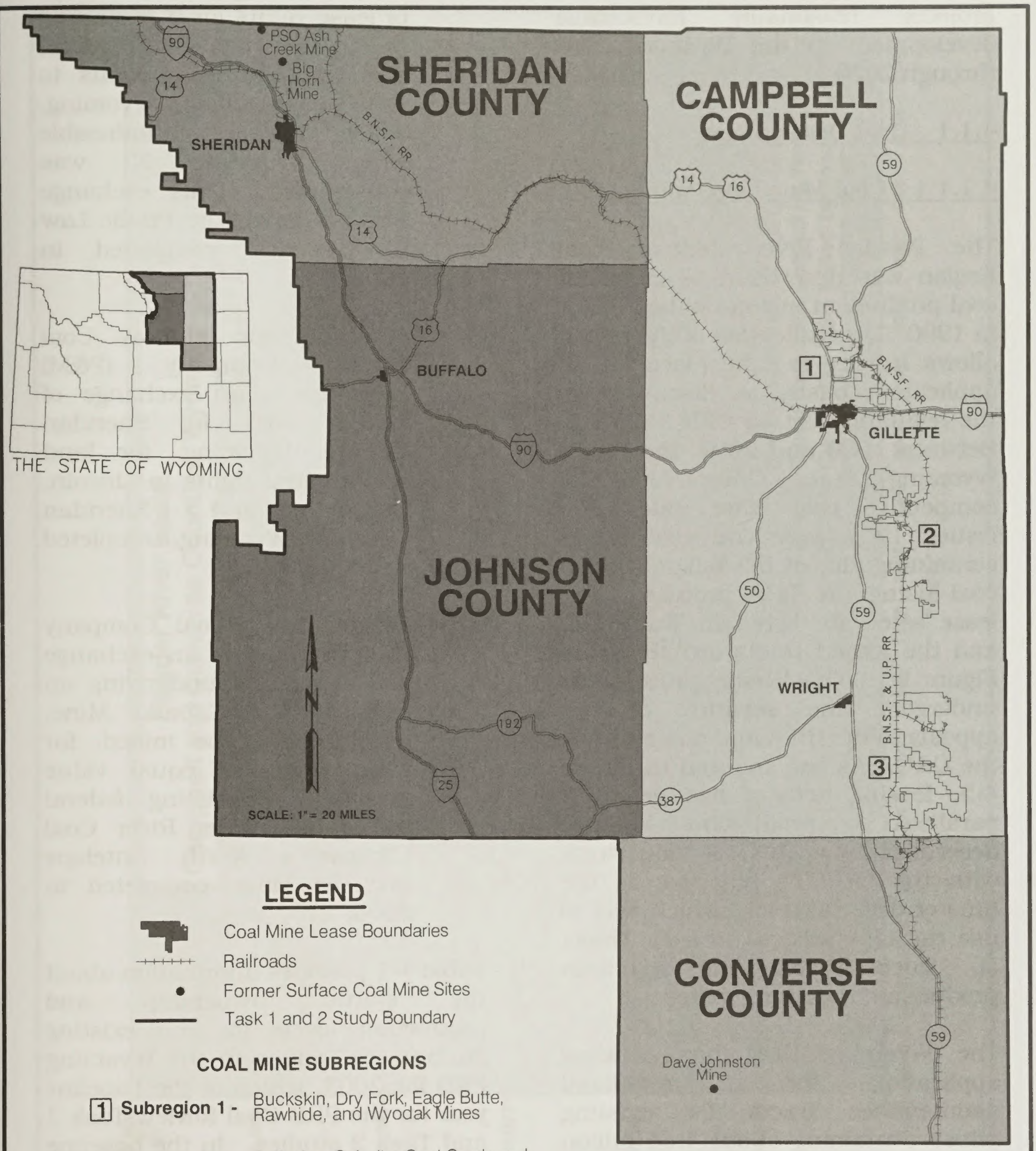

SHERIDAN COUNTY
CAMPBELL COUNTY
JOHNSON COUNTY
CONVERSE COUNTY
PSO Ash Creek Mine
Big Horn Mine
SHERIDAN
BUFFALO
GILLETTE
WRIGHT
Dave Johnston Mine
B.N.S.F. RR
B.N.S.F. & U.P. RR
90
14
16
59
50
192
25
387
1
2
3
N
SCALE: 1"= 20 MILES
THE STATE OF WYOMING
LEGEND
Coal Mine Lease Boundaries
Railroads
Former Surface Coal Mine Sites
Task 1 and 2 Study Boundary
COAL MINE SUBREGIONS
1 Subregion 1 - Buckskin, Dry Fork, Eagle Butte, Rawhide, and Wyodak Mines
2 Subregion 2 - Belle Ayr, Caballo, Coal Creek, and Cordero-Rojo Mines
3 Subregion 3 - Antelope, North Rochelle/Black Thunder, Jacobs Ranch, and North Antelope/Rochelle Mines

Figure 4-1. Wyoming Study Area for PRB Coal Review Studies Evaluating Current and Projected Levels of Development.

PRB as of the end of 2003 and projects reasonably foreseeable development in the Wyoming PRB through 2020.

4.1.1 Coal Development

4.1.1.1 Coal Mine Development

The Powder River Federal Coal Region was decertified as a federal coal production region by the PRRCT in 1990. Decertification of the region allows leasing to take place on an application basis, as discussed in the regulations at 43 CFR 3425.1-5. Between 1990 and 2005, the BLM's Wyoming State Office held 23 competitive coal lease sales and issued 17 new federal coal leases containing almost 5.2 billion tons of coal using the LBA process. The lease sales are listed in Table 1-1, and the leased tracts are shown in Figure 1-1. This leasing process has undergone the scrutiny of two appeals to the IBLA and one audit by the GAO. As can be seen in Figure 4-2, leasing activity has generally paralleled production since decertification. This is consistent with the PRRCT's objective at the time of decertification, which was to use the LBA process to lease tracts of federal coal to maintain production at existing mines.

The Wyoming BLM has pending applications for 12 additional maintenance tracts for existing mines containing about 4.44 billion tons of coal (Table 1-2).

BLM has also completed three exchanges involving federal coal resources in the Wyoming PRB since decertification:

- Belco Exchange – an exchange of lease rights for a portion of the former Hay Creek federal coal tract for lease rights to coal near Buffalo, Wyoming, which became unmineable when Interstate 90 was constructed. This exchange was authorized by Public Law 95-554 and completed in 2000.

- Pittsburg and Midway Coal Mining Company (P&M) Exchange – an exchange of federal coal in Sheridan County, Wyoming, for land and mineral rights in Lincoln, Carbon, and Sheridan Counties, Wyoming, completed in 2004.

- Powder River Coal Company AVF Exchange - an exchange of lease rights underlying an AVF at the Caballo Mine, which cannot be mined, for lease rights of equal value adjacent to existing federal leases at Powder River Coal Company's North Antelope Rochelle Mine, completed in 2006.

Table 4-1 provides information about the status, ownership and production levels for the existing surface coal mines in the Wyoming PRB for 2003, which is the baseline year for the PRB Coal Review Task 1 and Task 2 studies. In the baseline year, there were 12 active surface coal mines and one inactive mine. The North Rochelle Mine was not operated as a separate mine in 2005 and 2006 following its purchase by the operator of the Black Thunder Mine. The North Rochelle Mine

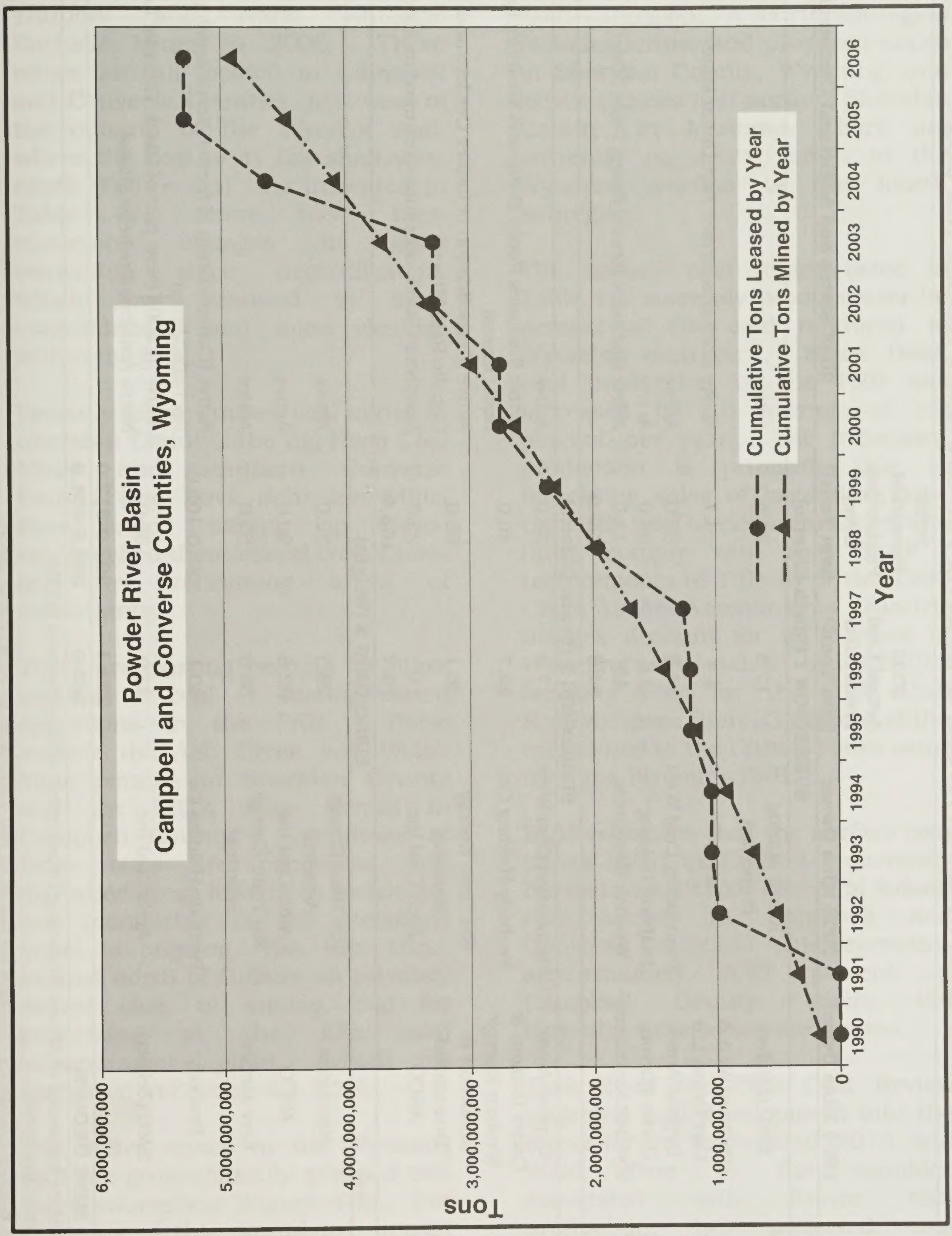


Figure 4-2. Tons of Federal Coal Leased Versus Tons of Coal Mined Since 1990.

Table 4-1. Status and Ownership of Wyoming PRB Coal Mines for the PRB Coal Review Baseline Year (2003).

2003 Mine	1994 Mine Owner	2006 Mine Owner	2003 Actual Coal Production (mm Tons)[1]	2003 Permitted Production Level (mm Tons)[2]	2003 Status and Additional Comments
SUBREGION 1 (North Gillette)					
Buckskin	SMC (Zeigler)	Kiewit Mining Properties	17.5	27.5	Active
Dry Fork	Phillips/WFA & Fort Union Ltd	WFA	4.4	24.4	Active (Includes former Fort Union Mine)
Eagle Butte	Cyprus-Amax	Foundation Coal West	24.5	35.0	Active
Rawhide	Carter (Exxon)	Peabody Holding Co.	3.6	24.0	Active
Wyodak	Wyodak Resources	Wyodak Resources	4.8	12.0	Active (Includes former Clovis Point Mine)
Total			**54.8**	**122.9**	
SUBREGION 2 (South Gillette)					
Belle Ayr	Cyprus-Amax	Foundation Coal West	17.9	35.0	Active
Caballo	Carter (Exxon) & Western Energy	Peabody Holding Co.	22.7	40.0	Active (Includes Rocky Butte and West Rocky Butte leases)
Cordero Rojo	Kennecott & Drummond	Rio Tinto Energy America[3]	36.1	65.0	Active (Consolidation of former Cordero and Caballo Rojo Mines)
Coal Creek	ARCO	Arch Coal Inc.	0	25.0	Inactive in 2003, operations resumed in 2006
Total			**76.7**	**165.0**	
SUBREGION 3 (Wright)					
Antelope	Kennecott	Rio Tinto Energy America[3]	29.5	32.0	Active
Black Thunder	ARCO	Arch Coal Inc.	62.6	90.0	Active
Jacobs Ranch	Kerr-McGee	Rio Tinto Energy America[3]	36.0	55.0	Active
N. Antelope/ Rochelle	Peabody	Peabody Holding Co.	80.1	85.0-105.0	Active (Consolidation of former North Antelope and Rochelle Mines)
N. Rochelle	SMC (Zeigler)	Arch Coal Inc.	23.9	35.0	Active in 2006 (Now part of Black Thunder and North Antelope Rochelle Mines)
Total			**232.1**	**297.0-317.0**	
TOTAL FOR 3 MINE GROUPS			**363.6**	**584.9-604.9**	

[1] Wyoming State Inspector of Mines (Wyoming Department of Employment 2003).

[2] WDEQ permitting levels.

[3] Kennecott Energy Company changed its name to Rio Tinto Energy America in 2006.

leases were divided between Black Thunder and North Antelope Rochelle Mines in 2006. These mines are all located in Campbell and Converse Counties, just west of the outcrop of the Wyodak coal, where the coal is at the shallowest depth (Figure 1-1). As indicated in Table 4-1, there have been numerous changes in mine ownership since decertification, which have resulted in mine consolidations and mine closings within the PRB.

Recently active surface coal mines in Sheridan County, (the Big Horn Coal Mine) and southern Converse County (the Dave Johnston Mine) have ended mining operations, relinquished their federal coal leases, and are reclaiming areas of disturbance.

There are existing permits for other surface coal mining-related operations in the PRB. These include the Ash Creek and Welch Mine permits in Sheridan County and the IZITA Mine permit in Campbell County. Operations at these sites are completed and disturbed areas have been reclaimed, but monitoring of the reclaimed areas is ongoing. The KFx Mine, located north of Gillette on privately owned coal, is mining coal for processing at the KFx coal enhancement plant, which is discussed in Section 4.1.1.2.4.

The active mines in the Wyoming PRB are geographically grouped into three subregions (Figure 4-1). For purposes of this cumulative impact discussion, these subregions are called the North Gillette, South Gillette, and Wright subregions. Table 4-1 lists the mines included in each subregion. A fourth subregion includes former and proposed mines in Sheridan County, Wyoming, and existing mines just north of Sheridan County, in Montana. There are currently no active mines in the Wyoming portion of the fourth subregion.

The surface coal mines listed in Table 4-1 currently produce over 96 percent of the coal produced in Wyoming each year. Since 1989, coal production in the PRB has increased by an average of six percent per year. The increasing production is primarily due to increasing sales of low-sulfur, low-cost PRB coal to electric utilities who must comply with the Phase I requirements of Title III of the 1990 Clean Air Act Amendments. Electric utilities account for 97 percent of Wyoming's coal sales. In 2003 (the baseline year for the PRB Coal Review), more than 33 percent of the coal mined in the United States came from the Wyoming PRB.

BLM estimates that the surface coal mines listed in Table 4-1 currently have almost 121,200 acres of federal coal leased in Campbell and Converse Counties. This represents approximately 3.97 percent of Campbell County, where the majority of the leases are located.

Task 2 of the PRB Coal Review projected coal development into the future for the years 2010, 2015, and 2020. Due to the variables associated with future coal production, two projected coal production scenarios (representing an upper and a lower production level) were developed to bracket the most likely foreseeable regional coal production level. The basis for the projected production levels included:

1) an analysis of historic PRB production levels in comparison to the gross domestic product and national coal demand;

2) an analysis of current PRB coal market forecasts that model the impact of gross domestic product growth, potential regulatory changes affecting coal-fired power plants, and mining and transportation costs on PRB coal demand;

3) the availability, projected production cost, and quality of future mine-specific coal reserves within the PRB region; and

4) the availability of adequate infrastructure for coal transportation.

The projected upper and lower production levels subsequently were allocated to the Wyoming PRB subregions, discussed above, and to individual mines based on past market shares. Individual mine production levels were reviewed relative to potential future production constraints (e.g., loadout capacities), permitted production levels, mining costs, and coal quality. Then the projected future production was aggregated on a subregion basis. The actual 2003 production level and the two projected coal production scenarios in five-year increments through 2020 are shown in Figure 4-3 and Tables 4-2 and 4-3.

Tables 4-2 and 4-3 also show the cumulative coal mining disturbance as of the baseline year and the cumulative coal mine disturbance projected for the future years for the upper and lower production scenarios. In these tables, the baseline year and cumulative projected disturbance areas are broken down into three categories:

- areas that are or are projected to be permanently reclaimed;

- areas that are or are projected to be undergoing active mining or which have been mined but are not yet reclaimed; and

- areas that are or are projected to be occupied by mine facilities, haul roads, stockpiles, and other long-term structures, and which are therefore unavailable for reclamation until mining operations are completed.

The two tables also include estimates of baseline year and projected future coal mining employment, water consumption, and water production.

As discussed in Section 1.2, based upon the current projected annual coal production over the life of the mine, CMC currently estimates that the existing recoverable reserves at the Cordero Rojo Mine will be depleted within approximately ten years at an average production rate of approximately 40 mmtpy. If they acquire a lease for the Maysdorf LBA Tract, CMC anticipates that the average rate of annual production would not increase, and that the mine would extend its productive life by six years. The existing and

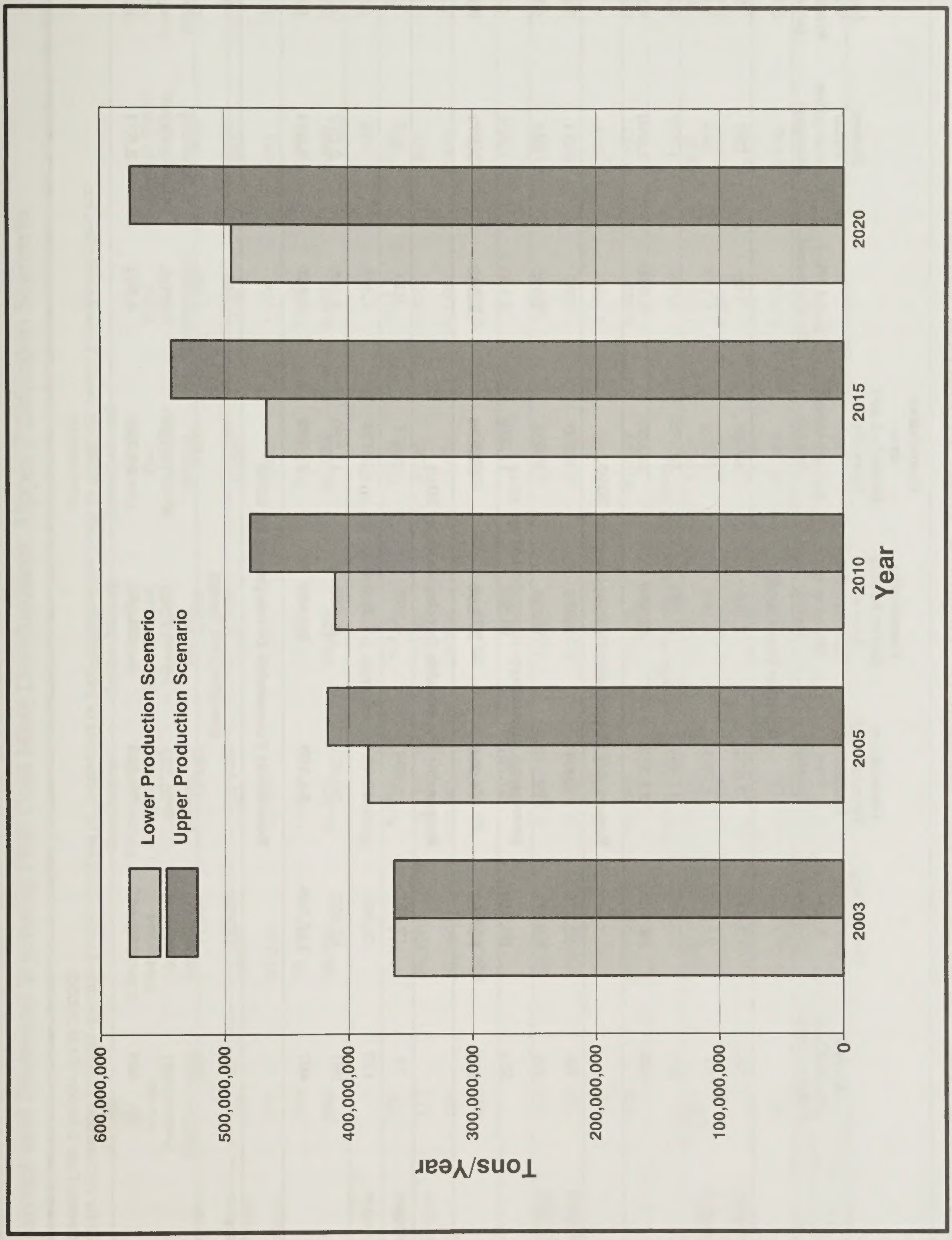


Figure 4-3. Projected Total Coal Production from Campbell and Converse Counties Under the Lower and Upper Production Scenarios.

Table 4-2. Current and Projected Wyoming PRB Coal Mine Development, Lower Production Scenario.

Subregion	Annual Production (million tons)	Cumulative Disturbed Area (acres)	Cumulative Permanently Reclaimed Area (acres)	Cumulative Active Mining Area and Unreclaimed Mined Area (acres)	Cumulative Area Disturbed and Unavailable For Reclamation[1] (acres)	Total Mine Employment	Annual Water Consumption (mmgpy)	Annual Water Production (acre-feet)
Baseline year (2003)								
North Gillette Subregion	55	12,047	3,054	3,360	5,633	746	387	586
South Gillette Subregion	77	21,249	6,783	6,107	8,359	1,174	544	1,373
Wright Subregion	231	35,498	11,401	13,992	10,105	3,090	1,709	2,295
Total for 2003	**363**	**68,794**	**21,238**	**23,459**	**24,097**	**5,010**	**2,640**	**4,254**
Reasonably Foreseeable Development for 2010								
North Gillette Subregion	62	15,231	5,004	3,968	6,260	787	441	505
South Gillette Subregion	95	28,021	12,183	6,830	9,008	1,323	656	2,072
Wright Subregion	254	55,410	27,751	16,588	11,070	3,153	1,874	4,354
Total for 2010	**411**	**98,662**	**44,938**	**27,386**	**26,338**	**5,263**	**2,971**	**6,931**
Reasonably Foreseeable Development for 2015								
North Gillette Subregion	74	17,457	6,654	4,202	6,601	830	543	505
South Gillette Subregion	112	32,356	15,683	7,314	9,359	1,369	764	2,072
Wright Subregion	281	67,423	38,851	16,983	11,589	3,186	2,077	4,354
Total for 2015	**467**	**117,236**	**61,188**	**28,499**	**27,549**	**5,405**	**3,384**	**6,931**
Reasonably Foreseeable Development for 2020								
North Gillette Subregion	78	19,729	8,429	4,350	6,950	840	569	505
South Gillette Subregion	126	36,994	19,683	7,589	9,723	1,476	845	2,072
Wright Subregion	291	80,720	51,351	17,243	12,124	3,215	2,157	4,354
Total for 2020	**495**	**137,443**	**79,463**	**29,182**	**28,797**	**5,531**	**3,571**	**6,931**

[1] Area unavailable for reclamation includes disturbed areas occupied by permanent or long-term facilities such as buildings, roads, topsoil stockpiles, etc.

Source: PRB Coal Review Task 2 Report (BLM 2005d)

Table 4-3. Current and Projected Wyoming PRB Coal Mine Development, Upper Production Scenario.

Subregion	Annual Production (million tons)	Cumulative Disturbed Area (acres)	Cumulative Permanently Reclaimed Area (acres)	Cumulative Active Mining Area and Unreclaimed Mined Area (acres)	Cumulative Area Disturbed and Unavailable For Reclamation[1] (acres)	Total Mine Employment	Annual Water Consumption (mmgpy)	Annual Water Production (acre-feet)
Baseline Year (2003)								
North Gillette Subregion	55	12,047	3,054	3,360	5,633	746	387	586
South Gillette Subregion	77	21,249	6,783	6,107	8,359	1,174	544	1,373
Wright Subregion	232	35,498	11,401	13,992	10,105	3,090	1,709	2,295
Total for 2003	**363**	**68,794**	**21,238**	**23,459**	**24,097**	**5,010**	**2,640**	**4,254**
Reasonably Foreseeable Development for 2010								
North Gillette Subregion	78	15,911	5,404	4,217	6,290	811	570	505
South Gillette Subregion	117	29,279	13,416	7,536	8,328	1,375	807	2,072
Wright Subregion	284	57,258	27,951	18,236	11,070	3,153	2,101	4,354
Total for 2010	**479**	**102,448**	**46,771**	**29,989**	**25,688**	**5,339**	**3,478**	**6,931**
Reasonably Foreseeable Development for 2015								
North Gillette Subregion	104	18,490	7,329	4,500	6,660	905	785	505
South Gillette Subregion	138	35,624	18,616	8,248	8,760	1,431	952	2,072
Wright Subregion	301	70,431	39,451	19,391	11,589	3,186	1,834	4,354
Total for 2015	**543**	**124,545**	**65,396**	**32,139**	**27,009**	**5,522**	**3,571**	**6,931**
Reasonably Foreseeable Development for 2020								
North Gillette Subregion	121	21,311	9,529	4,766	7,013	1,019	935	505
South Gillette Subregion	148	42,981	25,016	8,758	9,206	1,444	1,018	2,072
Wright Subregion	307	84,797	51,651	21,021	12,124	3,215	2,279	4,354
Total for 2020	**576**	**149,089**	**86,196**	**34,545**	**28,345**	**5,678**	**4,232**	**6,931**

[1] Area Unavailable for reclamation includes disturbed areas occupied by permanent or long-term facilities such as buildings, roads, topsoil stockpiles, etc.
Source: PRB Coal Review Task 2 Report (BLM 2005d)

projected coal development levels and associated disturbance shown in Tables 4-2 and 4-3 include production at the Cordero Rojo Mine during the baseline year (2003) and projected production at the mine for 2010, 2015, and 2020. As discussed above, the projected development levels shown in Tables 4-2 and 4-3 are based on projected demand and coal market forecasts, which are not affected by a decision to lease or not to lease the Maysdorf LBA Tract.

4.1.1.2 Coal-Related Development

Coal-related development as defined for this analysis includes railroads, coal-fired power plants, major (230-kV) transmission lines, and coal technology projects. Table 4-4 summarizes the estimated disturbance associated with coal-related development activities for the baseline year and the projected disturbance through 2020. The subsequent paragraphs summarize the existing coal-related development in the Wyoming PRB and the reasonably foreseeable development considered in the PRB Coal Review.

4.1.1.2.1 Coal Transportation

As discussed above, electric utilities account for about 97 percent of Wyoming's coal sales. Most of the coal sold to electric utilities is transported to power plants by rail. The coal mines in the Wright and South Gillette subregions are served by a joint BNSF & UP rail line. The existing capacity of the line is estimated at approximately 350 mmtpy. The existing capacity of the BNSF line, which services the North Gillette subregion, is estimated at 250 mmtpy.

The two projects related to coal transportation that are projected to be developed prior to 2020 are expansion of the BNSF & UP rail facilities south of Gillette and the construction of the DM&E rail line in Wyoming and South Dakota.

UP and BNSF are upgrading sections of their existing joint rail line, including construction of 14 miles of a third main line track completed in Spring 2005, 19 miles of a third main line track scheduled to be fully operational in September 2006, and an additional 40 miles of third and fourth main line track to be constructed by 2009. In 2005, the capacity of the BNSF & UP joint line was 325 million tons per year. The scheduled improvements will enable the joint line to handle more than 400 million tons of coal per year (UP and BNSF press release 2006). These expansion projects are considered highly likely to occur.

The proposed DM&E rail line would include new rail construction in South Dakota and Wyoming (approximately 15 and 265 miles, respectively) and 600 miles of rail line rehabilitation in South Dakota and Minnesota. Approximately 78 miles of the new rail construction would occur in the PRB study area, where the project would provide new rail spur services to the mines in the South Gillette and Wright subregions. The STB released a final supplemental EIS for this project on December 30, 2005 and granted final approval to construct the rail line on February 15, 2006. The supplemental EIS addresses issues that were successfully appealed after a final EIS was initially completed in 2001. For the purposes of the PRB

Table 4-4. Current and Projected Wyoming PRB Coal-Related Development Scenario.

	2003	2010	2015	2020
Coal-Related Disturbance (Acres)	4,891	4,966	5,911	5,911

Source: PRB Coal Review Task 2 Report (BLM 2005d)

Coal Review, it was projected that the DM&E line would be constructed when the total rail haulage requirement from the eastern Wyoming PRB reaches 450 to 500 million tons per year and would potentially be operational by 2015. The construction of this rail line is considered moderately likely to occur.

4.1.1.2.2 Electric Power Generation

Currently, there are four coal-fired power plants in the Wyoming PRB study area for Tasks 1 and 2. Black Hills Power Corporation owns and operates the Neal Simpson Units 1 and 2 (21.7-MW and 80-MW, respectively), WYGEN 1 (80-MW), and Wyodak (330-MW) power plants, all of which are located approximately five miles east of Gillette, Wyoming. Pacific Power and Light's Dave Johnston Power Plant is located near Glenrock, Wyoming, outside of but adjacent to the study area.

There are also three separate interconnected gas-fired power plants (Hartzog, Arvada, and Barber Creek) located near Gillette, Wyoming. Each contains three separate 5-MW-rated turbines that provide electric power to Basin Electric and its customers. In winter, the maximum capacity can reach 22.6-MW from each site. All units are in operating condition, although they do not operate at maximum capacity.

Several additional power plants are projected to be built prior to 2020 (Figure 1-1). Any proposed coal-fired power plant that plans to initiate operation by 2010 currently would have to be undergoing air permit review in order to obtain the required construction permits and complete construction by 2010. The following three identified projects currently are considered likely for development by 2010.

- Black Hills Power Corporation's WYGEN 2 coal-fired unit, located east of Gillette, currently is under construction and scheduled to be completed by the beginning of 2008. As originally permitted, this unit had a planned production capacity of 500-MW, which would consume approximately 2.8 million tons of coal per year. A permit modification has since dropped the initial phase to 90-MW. The facility would cover 60 acres within the existing 200-acre Black Hills Power and Light power plant area. Operation of this facility by 2010 is considered highly likely.

- North American Power Group has been working to permit and build a coal-fired power plant (Two-Elk Unit 1) since 1997 at a 40-acre site located approximately 15 miles southeast of Wright, Wyoming.

Currently, the proposal is for a 320-MW coal-fired power plant. The original air permit was issued in August 2002. The unit would be dry-cooled, requiring very little water. North American Power Group has received approval to receive several hundred million dollars in tax-exempt bonds from the state to help finance the project and is seeking additional funding. Operation of this facility by 2010 is considered moderately likely.

- Basin Electric Power Cooperative obtained a permit to construct and operate the Dry Fork Station Power Plant from the Wyoming Industrial Siting Council in June 2006. As proposed, the Dry Fork Station would be a coal-based, mine-mouth 385-MW power plant located near the Dry Fork Mine, north of Gillette. Basin Electric plans to start construction in April, 2007; and they estimate that the plant will be operational by 2011 (WDEQ/ISD 2007). Construction and operation of this facility as scheduled is considered moderately likely.

The PRB Coal Review assumes that, under the upper development scenario, a maximum of one additional 700-MW coal-fired power plant would be constructed by 2020 in the Gillette area or near one or more of the operating coal mines. North American Power Group submitted an application in September, 2007, for a 750-MW coal-fired power plant, Two Elk 2, to be located at the same site as the proposed Two Elk plant, discussed above. Black Hills Power Corporation has also begun permitting the Wygen III power plant, which is planned to be similar in design to the Wygen II plant. The study assumes that all existing power plants in the PRB region would remain operational through 2020.

4.1.1.2.3 Transmission Lines

Major transmission lines in the Wyoming PRB study area that support the regional distribution system are associated with the Dave Johnston power plant located near Glenrock, Wyoming, and the power plants operated by Black Hills Power Corporation, which are located east of Gillette. These 230-kV transmission lines have been in place for several years, and their associated permanent disturbance is minimal. Distribution power lines associated with conventional oil and gas and CBNG development also occur within the study area. For the PRB Coal Review, these lines were included by factoring them in proportionally on a per well basis.

The PRB Coal Review estimates that by 2020, one major transmission line would be constructed running south to Colorado markets and one would be constructed eastward to mid-west markets. Markets would dictate the size and location of such facilities, and these are not known as of this time. Because transmission lines are a necessary supporting infrastructure for power generating facilities to provide connection to the grid, the PRB Coal Review assumes they would be required as part of the overall system development for the proposed power plants discussed in the previous section. However, there was insufficient information to analyze or assign a likelihood of development by 2020 when the PRB Coal Review analysis was conducted because no specific proposals for these transmission lines had been identified at that time. No specific proposals have since been announced, but the governors of California, Nevada, Utah and Wyoming entered into a Memorandum of Understanding to encourage development of a high voltage power transmission line, the Frontier Line, connecting those states in April 2005. Since that time, no specific plans have been announced as to the location or timing of the Frontier Line.

4.1.1.2.4 Coal Conversion Technology

With rising energy prices, there has been considerable interest in converting coal to other fuels. Test facilities were previously constructed by KFx at the Fort Union Mine (now part of the Dry Fork Mine), by AMAX (predecessor to Foundation Coal West, Inc.) at the Belle Ayr Mine, and by ENCOAL at the Buckskin Mine, but no commercial production occurred and these facilities either have been dismantled or are no longer in use. Although several coal conversion projects have been proposed, as discussed below, only one (the KFx Coal Beneficiation Project) was considered to have a high enough likelihood of proceeding to include in the PRB Coal Review based on current status and available information.

Construction is near completion at the KFx coal beneficiation plant, located near the Dry Fork Mine, north of Gillette. KFx reported making a production run and shipping coal to two customers for test burns in late December, 2005, and reported that a trainload of enhanced coal had been loaded and sent to a customer in Ohio in August 2006. It is expected that the plant would eventually produce approximately 750,000 tons of enhanced coal per year. This operation has a high likelihood of proceeding with production given the technology being used and the forecast market conditions in the PRB. If the process and market prove competitive, the company has suggested that up to five additional units could be built in the PRB, but the likelihood for development of additional units is not known. As a result, the potential development of additional units was not analyzed in the PRB Coal Review.

The following coal conversion projects have been proposed, but were not included in the PRB Coal Review analysis because the likelihood of their occurrence was not known when the coal review analysis was conducted:

- Medicine Bow Fuel and Power, a subsidiary of DKRW Energy LLC, has announced that it plans to build a coal-to-liquids plant in northern Carbon County, Wyoming, which is outside of the PRB. GE Energy and Rentech Clean Energy Solutions are also involved in the project, which would obtain coal from Arch Coal's Hanna Mine facility. As proposed, the plant would produce about 11,000 barrels per day; the primary product would be ultra-low-sulfur diesel fuel. The project is entering the design stage and no construction schedule has been announced.

- KFx has proposed joint ventures with Arch Coal, Inc. and Kiewit Mining Group to develop beneficiation plants at the Coal Creek and Buckskin Mines, respectively. The companies are evaluating these projects.
- Coal gasification development projects are being actively pursued in both Montana and Wyoming. While there appears to be substantial interest in these opportunities, it is unknown whether large-scale operations would be developed within the 2010 to 2020 timeframe, given permitting, engineering, and construction time requirements. A project proponent with adequate financing to pursue such development had not been identified when the PRB Coal Review was prepared and has not been identified since.

A summary of past, present, and reasonably foreseeable coal mines, coal-related facilities, coal production, coal mine employment, and coal and coal-related disturbance in the Wyoming PRB is presented in Table 4-5.

4.1.2 Oil and Gas Development

4.1.2.1 Conventional Oil and Gas

Conventional oil and gas development includes all non-CBNG development activity. Approximately 1,500 conventional oil and gas wells, including producing, non-producing and injection wells, were drilled between 1990 and 2003 (IHS 2004). Of those, 60 percent were development wells (drilled in established producing areas) and 40 percent were classified as wildcat producing areas or drilled to evaluate untested prospective zones in producing areas. Approximately 25 percent of the wildcat wells were successful and resulted in the discovery of 61 new fields that provided 719,000 barrels of oil and 1.45 bcf of non-CBNG in the baseline year for the PRB Coal Review (2003) (WOGCC 2004); the remaining 75 percent of the wildcat wells were plugged and abandoned.

As of the end of 2003, there were approximately 3,500 producing conventional oil and gas wells in the Wyoming PRB study area plus 1,386 seasonally active wells (IHS 2004). The WOGCC reported that these wells produced approximately 13 million barrels of oil and 40 bcf of conventional gas in 2003 (WOGCC 2004). The USGS (2002) estimated that the mean undiscovered non-coal bed hydrocarbon resource in the PRB (including Montana) is 1.8 billion BOE.

Most of Wyoming's current oil production is from old oil fields with declining production and the level of exploration drilling to discover new fields has been low (WSGS 2002).

Table 4-5. Past, Present, and Projected Wyoming PRB Coal Mine and Coal-Related Development Scenario.

Year	Coal Production (mmtpy)	Number of Active Coal Mines[1]	Number of Active Power Plants	Number of Active Coal Conversion Facilities[2]	Direct Coal Mine Employment	Total Coal Disturbance (acres)[3]
Past and Present						
1990	163	18	3	1	2,862	na
1995	247	19	4	1	3,177	na
2000	323	12	4	2	3,335	na
2003	363	12	4	0	5,010	73,685
Projected Development - Lower Production Scenario						
2010	411	13[1]	7	1[2]	5,263	103,628
2015	467	13[1]	7	1[2]	5,405	123,147
2020	495	13[1]	7	1[2]	5,531	143,354
Projected Development - Upper Production Scenario						
2010	479	13[1]	7	1[2]	5,339	107,414
2015	543	13[1]	7	1[2]	5,522	130,456
2020	576	13[1]	8	1[2]	5,678	155,000

[1] Mines have consolidated and may in the future. Also, new mines may be permitted to better access the coal reserves projected for mining by 2020.

[2] Several coal conversion facilities currently are being evaluated; however, there is only one for which the likelihood of future development currently can be assessed.

[3] Disturbance area includes coal mine and coal-related disturbance areas.

Source: Annual Report of the Wyoming State Mine Inspector (Wyoming Department of Employment 1990, 1995, 2000, and 2003) and PRB Coal Review Task 2 Report (BLM 2005d)

This situation is reflected in the PRB where, over the 10-year period from 1992 through 2002, oil production from conventional oil and gas wells in Campbell and Converse Counties decreased approximately 60.4 percent (from 32.8 million barrels in 1992 to 13.0 million barrels in 2002). A recent increase in oil prices is reversing projections of a continuing decline in oil and gas production; production is now expected to increase in the PRB, with a peak around 2010 of approximately 15.7 million barrels (WSO-RMG 2005b). Oil production in the short term may also be bolstered by some planned CO_2 flood projects in the PRB (WSGS 2003b). This temporarily projected upward trend in conventional oil and gas development is reflected in the PRB Coal Review projections (Table 4-6). The active wells identified in Table 4-6 include wells that produce year-round, seasonally producing wells, and service wells (mainly injection wells). It is estimated that there are approximately 2,000 idle conventional oil and gas wells in the PRB study area (WOGCC 2005c); however, the number of idle wells gradually would be reduced in the future through plugging programs, and the idle well locations (once the wells are abandoned) would be reclaimed and no longer represent a disturbance.

4.1.2.2 CBNG Development

Natural gas production has been increasing in Wyoming. In the PRB, this is due to the development of shallow CBNG resources. Commercial development of these resources began in limited areas west of and adjacent to the

Table 4-6. Current and Projected Wyoming PRB Conventional Oil and Gas Development Scenario.

	Existing		**Projected for Task 3 Study Area**		
Category	**2003 Task 1 Study Area**	**2003 Task 3 Study Area**	**2010**	**2015**	**2020**
Annual Gas Production (bcf)[1]	39.9	36.3	33.8	30.9	28.0
Annual Oil Production (mmbo)	12.9	11.4	13.8	12.5	11.2
Active and Seasonably Active Wells	5,067	3,890	5,603	5,115	4,625

[1] Future gas production per well was estimated based on 2003 production levels per subwatershed. A greater number of future well sites were assumed to occur in locations with historically lower production rates, so the projected future conventional gas production varies within the cumulative effects study area relative to the number of projected producing wells.

Source: PRB Coal Review Task 2 Report (BLM 2005d)

northernmost surface coal mines in the late 1980s. Since that time, CBNG development has spread south to encompass most of the area west of the surface coal mines and is continuing to spread farther west into other parts of the PRB Coal Review Task 1 and Task 2 study area.

On private and state oil and gas leases, the WOGCC and the Wyoming SEO authorize CBNG drilling. On federal oil and gas leases, BLM must analyze the individual and cumulative environmental impacts of all drilling (federal, state, and private), as required by NEPA, before CBNG drilling can be authorized. BLM does not authorize drilling on state or private leases but must consider the impacts from those wells in their NEPA analyses. In many areas of the PRB, the coal estate is federally owned, but the oil and gas estate is privately owned. A June 7, 1999 Supreme Court decision (98-830) assigned the rights to develop CBNG on a piece of land to the owner of the oil and gas estate.

At the end of 2003 (the baseline year for the PRB Coal Review), there were 14,758 producing CBNG wells in the study area (IHS 2004), and total production for 2003 was 346 bcf, or 88 percent of the total gas production from the basin (WOGCC 2004). From 1987 to 2003, the total cumulative gas production from PRB coals was over 1.2 trillion cubic feet. The total water production for the same time period was approximately 2.3 billion barrels (96,600 million gallons). Annual methane production increased rapidly between 1999 and 2003, but appears to have started to level off or even decrease. In 2003, the average CBNG production was 900 mmcfpd (Holcomb 2003). According to the Oil and Gas Journal (2004), CBNG production in the PRB reached a high of 977 mmcfpd in October of 2003 but decreased to 899 mmcfpd by March of 2004. Water production in 2003 amounted to more than 500 million barrels (21,000 million gallons), which represented a decrease from previous levels.

Since the early 1990s, the Wyoming BLM has completed numerous EAs and two EISs analyzing CBNG projects. The most recent of these is the four-volume Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project, which was completed in January 2003 (BLM 2003b). The level of CBNG development since 2003 appears to be lower than was forecast in that document. New CBNG well numbers fell from a high of slightly more than 4,600 in 2001 to approximately 2,000 in 2004. The PRB Coal Review Task 2 Report discusses the uncertain trends for future CBNG activity in recent years. The methodology used to project future activity is detailed in Appendix E of that report. Table 4-7 shows the current and projected levels of CBNG development levels used to evaluate projected cumulative environmental impacts in the PRB Coal Review.

4.1.2.3 Oil and Gas Related Development

Oil and gas related development activities considered in the PRB Coal Review include major transportation pipelines and refineries. Table 4-8, summarizes the net disturbance, reclamation, and water production associated with oil and gas activity (conventional oil and gas, CBNG, and major transportation pipelines) for 2003 (baseline year) and projects disturbance, reclamation, and water production for future years.

4.1.2.3.1 Pipelines

The availability of pipeline capacity for the transport of oil and gas to outside markets is a key factor in the development of CBNG and conventional oil and gas resources in the Wyoming PRB. Currently, there are 13 major transportation pipeline systems in the PRB that transport gas resources to markets outside of the basin (Flores et al. 2001). The current capacity of these pipeline systems is 1.9 bcf per day. As of the baseline year for the PRB Coal Review (2003), the combined natural gas production (CBNG and conventional gas) in the Wyoming PRB Coal Review Task 1 and Task 2 study area was approximately 1.03 bcf per day.

Major transportation pipelines also provide for transport of CO_2 to conventional oil fields for EOR. Increased recovery of crude oil also may depend somewhat on the availability of CO_2 for EOR projects, as well as the availability of pipelines to transport oil to refineries for processing.

Gathering lines and power lines associated with conventional oil and gas and CBNG development also occur within the study area; disturbance from these ancillary facilities were factored into the PRB Coal Review analysis on a per well basis.

A 315-mile-long pipeline project, the Bison Pipeline Project, was proposed in 2004 to move natural gas northward, directly out of the PRB and into the Northern Border Pipeline system (FERC 2004). Approximately 53 miles of the proposed route is within the Wyoming PRB Coal Review study area. No filing has been made with FERC, and the project is not included as an active project in Wyoming on the FERC website. As a

Table 4-7. Current and Projected CBNG Development Scenario for the Wyoming PRB.

	Existing		**Projected to Task 3 Study Area**		
Category	**2003 Task 1 Study Area**	**2003 Task 3 Study Area**	**2010**	**2015**	**2020**
Annual Production (bcf)	338	284	480	500	443
Active Wells	14,758	12,152	20,899	21,831	19,366

Source: PRB Coal Review Task 2 Report (BLM 2005d)

Table 4-8. Wyoming PRB Conventional Oil and Gas, CBNG, and Related Development Disturbance and Water Production.

	Existing[1]		**Projected for Task 3 Study Area[1]**		
Category	**2003 Task 1 Study Area**	**2003 Task 3 Study Area**	**2010**	**2015**	**2020**
Cumulative Disturbed Area (Acres)[2]	187,761	148,602	237,883	304,543	361,331
Cumulative Permanently Reclaimed Area (Acres)	115,045	90,548	160,175	225,426	288,536
Cumulative Unreclaimed Area (Acres)	72,715	58,053	77,707	79,108	72,794
Annual Water Production (mmgpy)	26,405	21,204	39,108	41,484	37,350

[1] Minor discrepancies in total acreages are the result of number rounding.

[2] Inclusive of conventional oil and gas and CBNG activities and major transportation pipelines. Disturbance associated with ancillary facilities (including gathering lines and distribution power lines) has been factored in a per well basis.

Source: PRB Coal Review Task 2 Report (BLM 2005d)

result, the Bison Pipeline project was assumed to have a low likelihood rating for the purposes of the PRB Coal Review.

Other pipeline projects are proposed in Wyoming; however, none of the currently proposed projects would be located in the PRB. Information on pipeline projects proposed in Wyoming can be found in the "For Citizens" section of the Federal Energy Regulatory Commission website at http://www.ferc.gov/forcitizens.asp.

The amount of available pipeline capacity could limit the amount of future CBNG development. Based on Holcomb (2003), estimates of the growth of Wyoming PRB CBNG production range from a 2003 level of 900 mmcfpd to 3 to 4 bcf per day around 2007, and it is anticipated that they would remain at or above those levels until 2015. If CBNG production levels reach 3 to 4 bcf per day, it is reasonable to assume that four to five pipeline projects (up to 1.0 bcf per day total capacity) could be built in the near future, but no formal proposals have been made to date. However, based on the assumptions in Appendix E of the PRB Coal Review Task 2 Report, the 2003 basin-wide CBNG production rate of 927 mmcfpd (IHS 2004) is projected to reach approximately 1.7 bcf per day in 2020. New pipeline construction projects were not considered in the PRB Coal Review analysis because the likelihood for additional new pipeline construction was unknown when the PRB Coal Review was prepared.

The CO_2 pipeline from Bairoil, Wyoming, to Salt Creek, Wyoming, may be extended into the study area to the Sussex Field to support EOR activity. Although it took many years for a CO_2 source to reach the Wyoming PRB, it is very likely that several pipelines could be built in the study area in the near future to provide additional gas for EOR projects. However, since no pipeline projects have been identified that would transport CO_2 beyond Salt Creek, the likelihood for construction of additional CO_2 pipelines was unknown when the PRB Coal Review analysis was prepared, and they were not considered.

4.1.2.3.2 Refineries

There are no existing petroleum refineries in the Wyoming PRB study area, and no plans for the construction and operation of any petroleum refineries in the Wyoming portion of the PRB have been identified.

4.1.3 Other Development Activity

4.1.3.1 Other Mining

Uranium, sand, gravel, bentonite, and clinker (or scoria) have been and are being mined in the Wyoming PRB study area.

There are three defined uranium districts in the PRB: Pumpkin Buttes, Southern Powder River, and Kaycee (BLM 2003b). Numerous mined out or uneconomic uranium mining sites are present in these districts. Uranium is currently produced in the Southern Powder River District using the in-situ leach method. Until recently, there were two operating in-situ uranium recovery sites in the PRB, but they have been combined into one operation (WSGS 2005b). There has been a recent increase in interest in uranium for power plants here and abroad. However, based on commodity forecasts as of June 2004, the PRB Coal Review did not project any additional uranium recovery development in the Wyoming PRB study area. Some claims have been staked since that time, although they are primarily land position plays with no specifically defined projects. As a result, the likelihood and potential timing of new uranium mining operations in the PRB is not known, and additional development was not projected in the PRB Coal Review analysis.

Bentonite is weathered volcanic ash that is used in a variety of products, including drilling mud and kitty litter, because of its absorbent properties. There are three major bentonite producing districts in and around the PRB: the Colony District in the Northern Black Hills, the Clay Spur District in the Southern Black Hills, and the Kaycee District west of Kaycee, Wyoming. Within the PRB Coal Review study area, bentonite is mined at Kaycee (WMA 2006). The PRB Coal Review assumed that bentonite mining would continue throughout the study period and that production would continue at existing active mines, with no new mines developed through 2020.

Aggregate, which is sand, gravel, and stone, is used for construction purposes. In the PRB, the more important aggregate mining localities are in Johnson and Sheridan Counties (WSGS 2004b). The largest identified aggregate operation is located in northern Converse County. It has an associated total disturbance area of approximately 67 acres, of which four acres have been reclaimed.

Scoria or clinker (which is formed when coal beds burn and the adjacent rocks become baked) is used as aggregate where alluvial terrace gravel or in-place granite/igneous rock is not available. Scoria generally is mined in the Converse and Campbell Counties portion of the Wyoming PRB study area.

Increased sand, gravel, and scoria production and associated surface disturbance are anticipated in the Wyoming PRB study area in the future because aggregate would be required for road maintenance and new construction activities as other primary resources, such as coal and oil and gas, continue to be developed. New operations and increased production from existing operations can be expected. These operations would vary in size based on the immediate need from the primary industries, but there is no specific information about these projected operations. As a result, new sand, gravel, or scoria operations were not analyzed in detail in the PRB Coal Review.

4.1.3.2 Industrial Manufacturing

There are a number of existing industrial manufacturing establishments located in the Wyoming PRB Coal Review study area. Most are relatively small with fewer than 25 employees; they predominately serve regional and local markets, and most are directly or indirectly related to energy resource development and production. Over the years, some of these firms have expanded such that they now support activities and serve markets outside of the region, but those operations remain dependent upon the local and regional markets to sustain their existing operations.

The PRB Coal Review anticipates that increased coal production would result in an increased demand for fuels and explosives. This increased demand could result in the need for the development of new off-site chemical feedstock plants in the study area. Project-specific information is not available, however, and the potential development of new chemical feedstock plants was not considered in the PRB Coal Review.

Local economic development organizations, including CCEDC and CANDO, are continually engaged in efforts to recruit or assist new business formation in the PRB study area. For example, CANDO is pursuing development of an ammonium nitrate plant (using methane as a feedstock) in the Bill, Wyoming, area, as well as an aluminum mill in the same general location. These and similar prospects are long-term potential projects whose outcomes are uncertain and for which little information and detail are available; as a result, they were not considered in the PRB Coal Review.

4.1.3.3 Reservoirs

Currently, there are five key water storage reservoirs in the Wyoming PRB Coal Review study area (Healy, Lake DeSmet, Muddy Guard No. 2, Gillette, and Betty No. 1) (HKM Engineering et al. 2002a and 2002b). The total disturbance associated with these five key water storage areas is 3,263 acres.

Based on the applicable water plans prepared for the Wyoming Water Development Commission for its Basin Planning Program (HKM Engineering et al. 2002a and 2002b), there are long range projections for development of additional reservoirs in the Wyoming PRB study area. However, none of these reservoirs have reached the planning stage; therefore, there was not enough information to analyze them in the PRB Coal Review.

4.1.3.4 Other Non-Energy Development

In addition to the specific projects and developments described above, a network of public and private physical infrastructure, private enterprises, and public activities has been developed in the PRB over time. Examples of infrastructure include the highway and road networks, airports, government offices, hospitals, public schools, municipal water systems, and extensive residential and commercial real estate development. Private enterprises include local retail and service establishments, newspaper publishing, and transportation and distribution firms.

The construction, maintenance, and continuing operations associated with this network of development represent an extensive series of public and private investments, as well as changes in land use, surface disturbances, water consumption, and the factors that characterize local air quality. Those investments and changes have occurred over a period of time and in response to many different influences.

Some of the identified current and anticipated plans or proposals for future investment in public, private, and commercial infrastructure in the PRB are summarized below.

- The WYDOT State Transportation Improvement Program for 2004 includes anticipated 2005 through 2009 construction costs for highway and airport maintenance, reconstruction, and improvement projects in the PRB Coal Review Study area of approximately $215.4 million. No construction of new highways is scheduled and no new airports are proposed between now and 2009.

- A $10.7 million expansion and renovation of the Campbell County courthouse was completed in late 2005.

- Expansion of the CAM-PLEX conference and multi-event center facility in Gillette was approved in a special election in May 2005.

- The 2005 approved master plans for Wyoming public school facilities spending included a total of $72.3 million in new capital construction for the seven school districts that are completely or partially in the Wyoming PRB study area (WSFC 2005).

- Construction and maintenance projects for the City of Gillette include a multi-year project to renovate and expand the waste water treatment plant.

- Commercial development includes recently completed construction of a Home Depot store and expansion of the Wal-Mart store in Gillette.

A capital facilities tax ballot question in Campbell County in the 2004 election asking voters to approve the imposition of a $0.01 sales and use tax (to be used for updated and expanded diesel mechanic and welding programs at the Gillette Campus of the Northern Wyoming Community College and for two community development projects in Wright) and an increase in the lodging tax were defeated in 2004. A renewed attempt to get the lodging tax on the ballot for the 2006 primary election failed to gain the approval of the Campbell County Board of Commissioners. There may be other attempts to place one or more of these projects on the ballot in future elections.

Given the timing, scale, year-to-year variability, relatively short construction timetables associated with such investments, the existence of a relatively large and diversified construction industry in the region and nearby areas, and the limited potential for these projects to alter long-term conditions in the PRB, they are not included in the PRB Coal Review analysis. However, one or more of these and similar projects could warrant consideration in a cumulative analysis for a site-specific project due to proximity or coincidental project schedules and timetables.

4.2 Cumulative Environmental Consequences

Section 4.1 of this chapter discusses current and projected levels of development in the Wyoming PRB, and includes summaries of the results of PRB Coal Review Task 2 studies. This section summarizes the current conditions resulting from baseline year (2003) development and the cumulative environmental consequences of the projected development for 2010, 2015, and 2020 based on the results of the analyses conducted for PRB Coal Review Task 1 and 3 reports, respectively.

As discussed in Section 4.1, the Wyoming portion of the PRB is the primary focus of the PRB Coal Review analyses. For the majority of resources in the Task 1 analysis, the Wyoming PRB Coal Review study area encompasses all of Campbell County, all of Sheridan and Johnson Counties outside of the Bighorn National Forest, and the northern portion of Converse County (Figure 4-1). The study areas for the Task 3 analyses are different. For the majority of the resources considered in the PRB Coal Review, the Task 3 study area is based on watershed boundaries in the PRB and includes the portions of the Upper Powder River, Little Powder River, Upper Belle Fourche River, Upper Cheyenne River, Antelope Creek, and Dry Fork Cheyenne River subwatersheds that lie within Sheridan, Johnson, Campbell and northern Converse Counties (Figure 4-4). This study area includes over 4 million acres. Table 4-9 summarizes the total disturbance and reclamation acreages for the baseline year of 2003 and the total projected disturbance and reclamation acreages for 2010, 2015, and 2020 within the Task 3 study area described above.

A total of approximately 220,688 acres of this land area had been disturbed by development activities as of 2003, which represents about 5.6 percent of the Task 3 study area. This is projected to increase to as much as 514,732 acres in 2020 under the upper coal production scenario. This area would represent approximately 13.1 percent of the Task 3 study area. This disturbance includes projected coal mining, coal-related development, and oil and gas and relate development disturbance in the Task 3 study area. Areas reclaimed during each future time period shown in Table 4-9 reflect how much of the disturbed acreage is projected to be permanently reclaimed by that point in time. The acres of unreclaimed disturbance would be reclaimed incrementally or following a project's completion, depending on the type of development activity and permit requirements. The acres currently not available for reclamation are occupied by long-term facilities that are needed to conduct mining operations or coal-related activities. These areas would be reclaimed near the end of each mine or facility's life.

Adjustments were made to the study area described above and shown in Figure 4-4 for several resources as described below:

- The potential air quality impacts were evaluated over a multi-state area (including most of Wyoming, southeastern Montana, southwestern North Dakota, western South Dakota, and northwestern Nebraska) because they would be expected to extend beyond the Wyoming and Montana PRB study area that was used to identify emissions sources for the air quality analysis.
- The groundwater drawdown was evaluated in the area surrounding and extending west of the surface coal mines, shown in Figure 4-4, because that is the area where groundwater drawdown related to surface coal mining

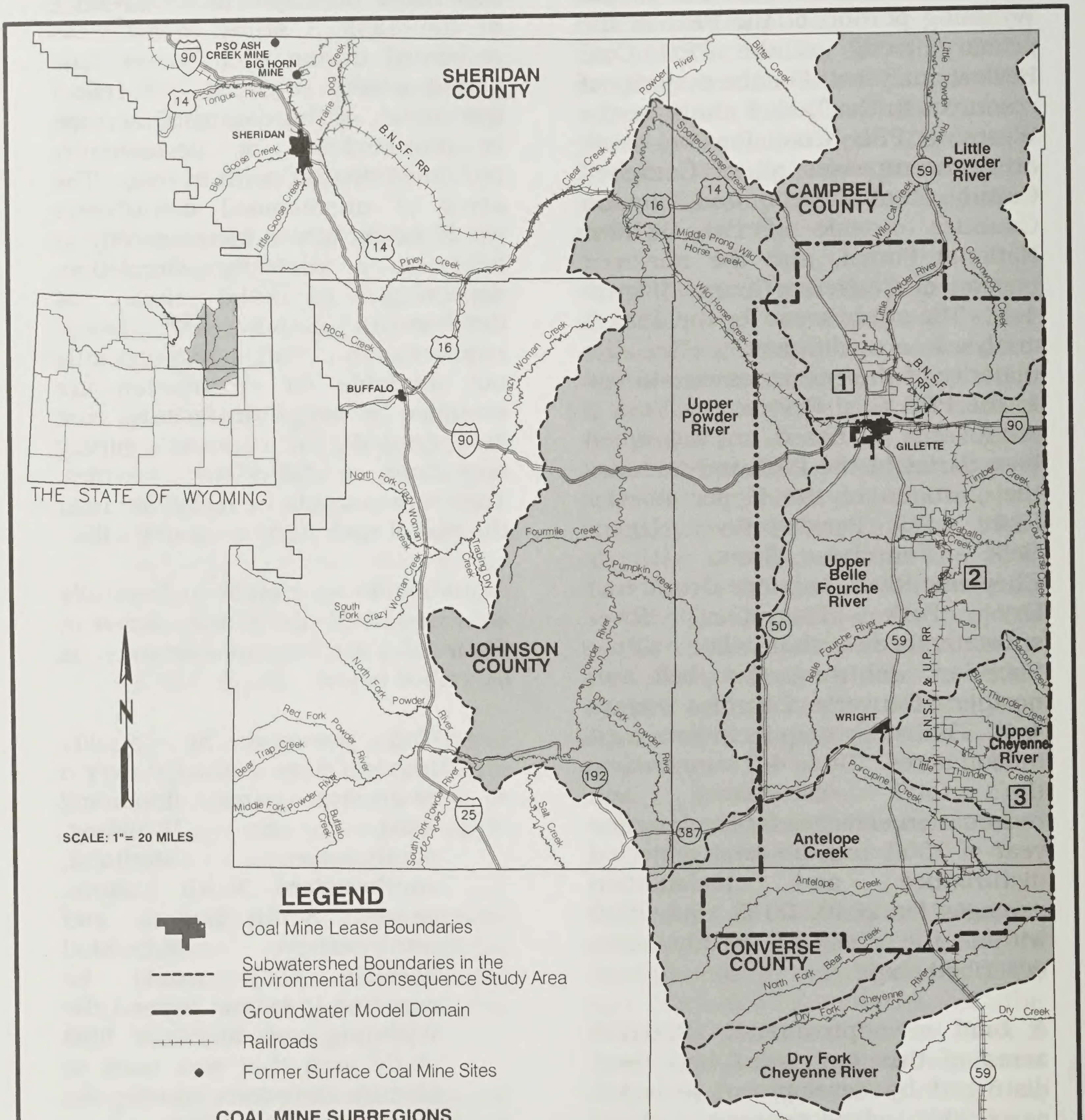

PSO ASH CREEK MINE
BIG HORN MINE
SHERIDAN COUNTY
SHERIDAN
Tongue River
Big Goose Creek
Little Goose Creek
Prairie Dog Creek
B.N.S.F. RR
Piney Creek
Clear Creek
Powder River
Bitter Creek
Spotted Horse Creek
Middle Prong Wild Horse Creek
Wild Horse Creek
Little Powder River
Little Powder River
CAMPBELL COUNTY
Wild Cat Creek
Cottonwood Creek
THE STATE OF WYOMING
Rock Creek
BUFFALO
Crazy Woman Creek
Upper Powder River
GILLETTE
B.N.S.F. RR
North Fork Crazy Woman Creek
Trabing Dry Creek
Fourmile Creek
Timber Creek
Caballo Creek
Four Horse Creek
Pumpkin Creek
Upper Belle Fourche River
South Fork Crazy Woman Creek
JOHNSON COUNTY
Powder River
Belle Fourche River
B.N.S.F. & U.P. RR
Bacon Creek
Black Thunder Creek
North Fork Powder River
Red Fork Powder River
Dry Fork Powder River
WRIGHT
Upper Cheyenne River
Little Thunder Creek
Porcupine Creek
Bear Trap Creek
Middle Fork Powder River
Buffalo Creek
South Fork Powder River
Salt Creek
Antelope Creek
Antelope Creek
SCALE: 1"= 20 MILES
N
CONVERSE COUNTY
Bear Creek
North Fork
Cheyenne River
Dry Fork
Dry Creek
Dry Fork Cheyenne River
DAVE JOHNSTON MINE
Sage Creek
90
14
16
14
16
90
25
192
387
50
59
59
59
90
1
2
3
LEGEND
Coal Mine Lease Boundaries
Subwatershed Boundaries in the Environmental Consequence Study Area
Groundwater Model Domain
Railroads
Former Surface Coal Mine Sites
COAL MINE SUBREGIONS
1 Subregion 1 - Buckskin, Dry Fork, Eagle Butte, Rawhide, and Wyodak Mines
2 Subregion 2 - Belle Ayr, Caballo, Coal Creek, and Cordero-Rojo Mines
3 Subregion 3 - Antelope, North Rochelle/Black Thunder, Jacobs Ranch, and North Antelope/Rochelle Mines

Figure 4-4. Wyoming Task 3 Study Area for PRB Coal Review Studies Evaluating Projected Environmental Consequences.

Table 4-9. Current and Projected Wyoming PRB Total Development Scenario – Task 3 Study Area.

Year	Total Acres Disturbed[1]	Acres Reclaimed[1]	Acres Unreclaimed[1]	Acres Unavailable for Reclamation[2]	Acres Affected by Coal Mining
Current					
2003	220,688	111,786	108,901	27,073	68,794
Projected Development - Lower Coal Production Scenario					
2010	339,912	205,113	134,799	29,389	98,662
2015	426,084	286,614	139,472	31,546	117,236
2020	503,085	367,999	135,085	32,794	137,443
Projected Development - Upper Coal Production Scenario					
2010	343,698	206,946	136,752	28,739	102,448
2015	433,392	290,822	142,570	31,006	124,545
2020	514,732	374,732	139,998	32,342	149,089

[1] Minor discrepancies in total acreages are the result of number rounding.
[2] Includes coal mine and coal-related disturbance.
Source: PRB Coal Review Task 2 Report (BLM 2005d)

operations and CBNG production operations would overlap.

- The socioeconomic impact analysis focused on Campbell County, but also considered Converse, Crook, Johnson, Sheridan, and Weston Counties as directly affected and Niobrara and Natrona Counties as indirectly affected.

4.2.1 Topography and Physiography

The PRB is located within the Upper Missouri Basin Broken Lands physiographic subprovince that includes northeastern Wyoming and eastern Montana to the Canadian border. The topography generally is of low to moderate relief with occasional buttes and mesas. The general topographic gradient slopes down gently from southwest to northeast with elevations ranging from 5,000 to 6,000 ft above sea level on the southern and western portions of the basin to less than 4,000 ft above sea level on the north and northeast along the Montana state line. The major drainages in the basin are the Tongue, Powder, Belle Fourche, and Cheyenne rivers. Most of the drainages in the area are intermittent and have flows during high precipitation events or during periods of snowmelt. The drainages are part of the upper Missouri River Valley drainage basin.

The disturbance associated with the majority of the past, present, and projected activities have resulted in or would result in the alteration of the surface topography. Surface coal mining, which is projected to continue in the area of the existing coal mines shown in Figure 4-4, permanently alters the topography by removing the overburden and coal and then replacing the overburden. Recontouring during reclamation to match approximate original contour, as required by regulation, reduces the long-term impact to topography. After mined-out areas are reclaimed, the restored land surfaces are typically gentler, with more uniform slopes and restored basic drainage networks. Oil and gas exploration and development has occurred and is projected to continue throughout most of the Task 3 study area. It also results in the alteration of topography to accommodate facilities (e.g., well pads, power plants, etc.) and roads, but the disturbance tends to occur in smaller, more discrete areas than coal mining and the development is spread out over a wider area.

The disturbance and reclamation acreages associated with all existing and projected development in the Task 3 study area for the years 2003, 2010, 2015, and 2020 are given in Table 4-9.

4.2.2 Geology, Mineral Resources, and Paleontology

The cumulative effects study area for geology, mineral resources, and paleontology is the PRB Coal Review Task 3 study area (Figure 4-4).

The PRB is one of a number of structural basins in Wyoming and the Rocky Mountain area that were formed during the Laramide Orogeny. The basin is asymmetric with a structural axis that generally trends northwest to southeast along the western side of the basin (Flores et al. 1999). Earthquakes, landsides, and subsidence do not present a hazard in the PRB based on the lack of active faults in the study area (USGS 2004); the low risk of ground shaking in the region if a maximum credible earthquake were to occur (Frankel et al. 1997); and the absence of evidence of subsidence, landslides, or other geologic hazards in association with CBNG production.

4.2.2.1 Coal

Most of the coal resources of the basin are found in the Fort Union and Wasatch Formations. The coals present in the Wasatch Formation are thinner and less continuous than the coals in the Fort Union and, therefore, they are not as economically important as the coals in the Fort Union for either coal mining or CBNG development. Projected levels of coal production and disturbance under the lower and upper coal production scenarios are shown in Tables 4-2 and 4-3.

In the coal mine areas, the overburden and coal would be removed and the overburden replaced, resulting in a permanent change in the geology of the area and a permanent reduction of coal resources.

4.2.2.2 Oil and Gas

Drilling for conventional oil and gas in the Wyoming PRB has declined considerably in the last 15 years. However, there remains potential for finding and developing these resources in the deeper areas of the basin. Conversely, CBNG production increased rapidly from 1999 through 2002 and leveled off in 2003. Projected production rates for conventional oil and gas and CBNG in 2010, 2015, and 2020 are shown in Tables 4-6 and 4-7.

Oil and gas and related development accounts for most of the projected mineral disturbance outside of the coal mining areas. It generally would result in shallow, discrete areas of surface disturbance, as discussed above. The acreages over which these impacts currently occur (as of 2003) and are projected to occur in the years 2010, 2015, and 2020 are shown in Table 4-9.

4.2.2.3 Other Mineral Resources

As discussed in Section 4.1.3.1, other mineral resources that are being mined in the Wyoming PRB include uranium, bentonite, clinker, and aggregate. Production of uranium and bentonite is not likely to be affected by development of coal or CBNG in the PRB. Aggregate and clinker production levels are more likely to be affected by other mineral development levels because these resources would be used in construction projects related to other mineral development.

4.2.2.4 Paleontology

Scientifically significant paleontological resources, including vertebrate, invertebrate, plant, and trace fossils, are known to occur in many of the geologic formations within the Wyoming PRB. These fossils are documented in the scientific literature, in museum records, and are known by paleontologists and land managers familiar with the area.

The Wasatch Formation is the most geographically widespread unit exposed on the surface over most of the Task 3 study area. It is underlain by the Fort Union Formation. The fossiliferous Morrison and Lance Formations outcrop in the western portion of the basin but occur at depth in the vicinity of the coal mines and CBNG activity in the eastern portion of the basin. Within the Task 3 study area, the highly fossiliferous White River Formation occurs only on Pumpkin Buttes in southwestern Campbell County.

Based on 2003 information, no significant or unique paleontological localities have been recorded on federal lands in the PRB. However, the lack of localities in the PRB does not mean that no scientifically significant fossils are present, as much of the area within and surrounding the PRB has not been adequately explored for paleontological resources. As a result, development activities in the Task 3 study area have the potential to adversely affect scientifically significant fossils, if they are present in or adjacent to disturbance areas. The potential for impacts to scientifically significant fossils would be greatest in areas where Class 4 or 5 formations are present (see Section 3.3.3.1). The Wasatch Formation is classified as a Class 5 formation. The Fort Union Formation is classified as a Class 3 formation, which means that fossil content varies in significance, abundance, and predictable occurrence. The greatest potential impact to surface and subsurface fossils would result from disturbance of surface sediments and shallow bedrock during construction and/or operations, depending on the type of project. Potential subsurface disturbance of paleontological resources (e.g., during drilling operations) would not be visible or verifiable. The areas over which these impacts occurred as of 2003 and are projected to occur as a result of all projected development in the years 2010, 2015, and 2020 are shown in Table 4-9. As only portions of the Task 3 study area have been evaluated for the occurrence of paleontological resources, and discrete locations for development activities cannot be determined at this time, no accurate estimate can be made as to the number of paleontological sites that may be affected by cumulative development activities.

Development activities which involve federally owned surface and/or minerals are subject to federal guidelines and regulations protecting paleontological resources. Protection measures, permit conditions of approval, and/or mitigation measures would be determined on a project-specific basis at the time of permitting to minimize potential impacts to paleontological resources as a result of these activities.

4.2.3 Air Quality

The Task 1A Report for the PRB Coal Review (BLM 2005a) documents the modeled air quality impacts of operations during a baseline year, 2002, using actual emissions and operations for that year. Emissions from permitted minor sources were estimated, due to unavailability of actual emissions data. The baseline year analysis evaluated impacts both within the PRB itself and at selected sensitive areas surrounding the region. The analysis specifically looked at impacts of coal mines, power plants, CBNG development, and other development activities. Results were provided for both Wyoming and Montana at the individual receptor areas. The Task 2 Report for the PRB Coal Review (BLM 2005d) identifies reasonably foreseeable development activities for the years 2010, 2015, and 2020. The Task 3A Report for the PRB Coal Review (BLM 2006b) evaluates the impacts on air quality and air quality-related values for the year 2010 using the development levels projected for 2010 and the same model and meteorological data that were used for the baseline year study in the Task 1A report. Impacts for 2015 and 2020 were projected qualitatively based on evaluation of anticipated changes in emissions and on modeled impacts for the 2010 lower and upper production scenarios. BLM is now considering updating the model and conducting a similar impact analysis for the year 2015. As currently proposed, a revised baseline year emissions inventory would be developed using 2004 actual emissions data or emissions estimates and incorporating recent analyses of emissions in Wyoming and Montana, which were not available when the 2010 modeling study was done.

Existing and projected emissions sources for the baseline year (2002) and 2010 analyses were identified within a study area comprised of the following counties in the PRB in Wyoming and Montana:

- Campbell County, all of Sheridan and Johnson Counties except the Bighorn National Forest lands to the west of the PRB, and the northern portion of Converse County, Wyoming.

- Rosebud, Custer, Powder River, Big Horn, and Treasure Counties, Montana.

A state-of-the-art, guideline dispersion model was used to evaluate impacts of the existing and projected source emissions on several source groups, as follows:

- Near-field receptors in Wyoming and Montana, which cover the PRB Coal Review Task 1A and 3A study area in each state. Overall, the near-field receptor grid points were spaced at one kilometer intervals over the study area;
- Receptors in nearby federally designated pristine or "Class I" areas; and
- Receptors at other sensitive areas (Class II sensitive areas).

The EPA guideline CALPUFF model system (Scire et al. 1999a) and the same meteorological data set were used for the Task 1A and Task 3A studies. The impacts for the baseline year (2002) and for 2010 lower and upper coal production scenarios were directly modeled. As discussed above, the modeling domain extends over most of Wyoming, southeastern Montana, southwestern North Dakota, western South Dakota, and western Nebraska. An interagency group participated in developing the modeling protocol and related domain that were used for this analysis.

The modeling approach for the Task 3A report used actual emissions from existing sources representative of 2002 operations and adjusted those emissions for the expected level of development in 2010. No specific emissions data were available for the projected levels of development. The baseline year emissions data were gathered from a variety of sources, but mainly relied on data collected by the WDEQ/AQD and the MDEQ. Only actual emission sources inside the study area described above were included in the modeling. Key major sources were included, such as the coal-fired power plants, gas-fired power plants, and sources that were included in the Title V (operating permit) program. Although the Dave Johnston power plant is located outside of but adjacent to the study area, in Converse County, it was included in the baseline year study and in the projected emissions. Some operational adjustments were made to accommodate small sources with air permits that were presumed to be operating at less than full capacity. Emissions from other sources, including estimated construction-related fugitive dust emissions, were computed based on EPA emission factors and on input data from WDEQ/AQD.

Meteorological data were developed for 1996 for the modeling domain, using the guideline Version V of the CALMET (Scire et al. 1999b) diagnostic model, identical to that used in the PRB Oil and Gas EIS Project (BLM 2003b) and in the Task 1A report. These data provide a four-dimensional depiction that represents actual meteorological conditions for that year. The data baseline was enhanced by using data for specific surface stations and precipitation data. Terrain and land use data from the USGS also were used. Modeling data settings generally were set to default values. Baseline year ozone concentrations also were incorporated into the model using measured concentrations representative of the study area, and were not changed for this study.

The existing regional air quality conditions generally are very good in the PRB Coal Review Task 1A and Task 3A study area. There are limited air pollution emissions sources (few industrial facilities, including the surface coal mines, and few residential emissions in relatively small communities and isolated ranches) and good atmospheric dispersion conditions. The available data show that the region is in compliance with the ambient air quality standards for NO_2 and SO_2. There have been no monitored exceedances of the annual PM_{10} standard in the Wyoming PRB, although, as discussed in Chapter 3 (Section 3.4.2.1.1), monitoring sites at some of the surface coal mines have shown some exceedances of the 24-hour PM_{10} standard since 2000. However, as also discussed in Chapter 3, there have been no monitored exceedances of the annual or 24-hour PM_{10} ambient air standard at the Cordero Rojo Mine. Air quality modeling indicates the currently projected mine activities at the Cordero Rojo Mine will be in compliance with the PM_{10} ambient air standards for the life of the mine at the permitted mining rate of 65 mmtpy, and the applicant proposes to mine at an average rate of 40 mmtpy during the time the Maysdorf LBA Tract would be mined. Visibility data colleted around the region indicate that, although there are some days with notable impacts at Class I areas, the general trend in the region shows little change in visibility impacts at Badlands National Park and at the Jim Bridger Wilderness area over the period from 1989 to 2003 (Figure 3-9).

Predicted impacts from baseline year (2002) and projected 2010 emissions were modeled for three air quality criteria pollutants (NO_2, SO_2, and PM_{10}), along with changes in air quality-related values at Class I areas and at identified sensitive areas. For regulatory purposes, the Class I PSD evaluations are not directly comparable to the air quality permitting requirements, because the modeling effort does not identify or separately evaluate increment consuming sources that would need to be evaluated under the PSD program. The cumulative impact analysis focuses on changes in cumulative impacts instead of on a comparison to PSD-related evaluations, which would apply to specific sources. Changes in impacts for three air quality criteria pollutants (NO_2, SO_2, and PM_{10}) were evaluated, along with changes in air quality-related values at Class I areas and at identified sensitive areas.

Table 4-10 presents the modeled impacts on ambient air quality at the near-field receptors in Montana and Wyoming. Results indicate the maximum impacts at any point in each receptor group, and data are provided for the baseline year (2002) analysis and for both development scenarios for 2010.

Table 4-10. Projected Maximum Potential Near-field Impacts (μg/m³).

Pollutant	Averaging Time	Base Year (2002) Impacts	2010 Lower Development Scenario Impacts	2010 Upper Development Scenario Impacts	NAAQS	Wyoming AAQS	Montana AAQS	PSD Class II Increments
Wyoming Near-field								
NO_2	Annual	37.3	42.4	49.0	100	100	--[1]	25
SO_2	Annual	3.9	4.8	5.6	80	60	--[1]	20
	24-hour	14.5	33.5	34.8	365	260	--[1]	91
	3-hour	37.9	148.0	154.2	1,300	1,300	--[1]	512
PM_{10}	Annual	42.7	49.0	**56.6**	--[2]	50	--[1]	17
	24-hour	**335.5**	**378.8**	**439.9**	150	150	--[1]	30
Montana Near-field								
NO_2	Annual	8.85	11.3	11.8	100	--[1]	100	25
	1-hour	365.8	415.9	519.5	--	--[1]	564	--
SO_2	Annual	1.3	2.3	2.7	80	--[1]	80	20
	24-hour	18.9	19.5	20.4	365	--[1]	365	91
	3-hour	74.7	76.4	79.8	1,300	--[1]	1,300	512
	1-hour	240.7	246.4	257.3	--	--[1]	1,300	--
PM_{10}	Annual	19.6	22.5	27.7	--[2]	--[1]	50	17
	24-hour	**175.8**	**200.0**	**247.7**	150	--[1]	150	30

1 No standard or increment.

2 On September 21, 2006, the EPA announced final revisions to the NAAQS for particulate matter, which took effect December 18, 2006. The revision revoked the annual PM_{10} standard of 50 μg/m³. The revisions retained the 24-hour PM_{10} standard. The State of Wyoming will enter into rulemaking to revise the Wyoming Ambient Air Quality Standards. See additional discussion in Chapter 3, Section 3.4.2.1.

Bold values indicate exceedance of AAQS.

Source: PRB Coal Review Task 3A Report (BLM 2006b)

Based on the modeling results, the baseline year (2002) impacts on ambient air quality were well below the ambient air quality standards, with an exception for PM_{10} emissions on receptors near PRB sources. The results indicate the maximum modeled 24-hour PM_{10} levels are greater than the 150 µg/m^3 ambient air standard some near-field receptors in both Montana and Wyoming. The modeling also showed impacts on visibility in the surrounding Class I areas are above the detectable levels at many receptor areas.

For the Montana near-field receptors, the impact on the 24-hour PM_{10} levels shows a maximum impact above the NAAQS for both coal development scenarios for 2010. The upper development scenario shows an increase in the impact of more than 40 percent above the baseline year for this parameter. Impacts at all other receptors show compliance with the NAAQS and the Montana AAQS. Large percentage increases in annual SO_2 impacts are projected, but the impacts themselves are well below the NAAQS.

For the Wyoming near-field receptors, the maximum modeled 24-hour PM_{10} levels are greater than the 150 µg/m^3 ambient air standard for the 2010 lower and upper coal production scenarios at some receptors. For the 2010 upper development scenario, the modeled levels are above 150 µg/m^3 at seven of the near-field receptors in Wyoming; those receptors are confined in an area of intensive coal development. As shown in Table 4-10, the maximum modeled PM_{10} impacts from all sources are nearly three times the 24-hour standard for the 2010 upper production scenario. As discussed in Section 3.4.1.1.1, modeling tends to over predict the 24-hour impacts of surface coal mining and, as a result, WDEQ/AQD does not consider short-term PM_{10} modeling to be an accurate representation of short-term impacts. In view of this, a Memorandum of Agreement between WDEQ/AQD and EPA Region VIII, dated January 24, 1994, allows WDEQ/AQD to conduct monitoring in lieu of short-term modeling for assessing coal mining-related impacts in the PRB. This agreement also requires Wyoming to implement "Best Available Work Practice" mitigation measures at any mine where an exceedance of the PM_{10} NAAQS has occurred. The monitored exceedances at surface coal mines in the Wyoming PRB and the measures that WDEQ/AQD has implemented or is proposing to implement to prevent future exceedances of the PM_{10} NAAQS are discussed in Chapter 3, Sections 3.4.2.1.1 and 3.4.2.3.

The maximum modeled impacts on the annual PM_{10} levels are also projected to be above the standard (50 µg/m^3) at one near-field receptor in Wyoming for the 2010 upper production scenario. Impacts of NO_2 and SO_2 emissions are predicted to be below the NAAQS and Wyoming AAQS at all Wyoming near-field receptors. A large portion of the impacts for all scenarios would be associated with coal-related sources, although non-coal sources would contribute a notable portion of the impact.

As indicated in Chapter 3:

- There have been no monitored exceedances of the 24-hour PM_{10} ambient air standard at the Cordero Rojo Mine or at the surface coal mines adjacent to the Cordero Rojo Mine.
- Air quality modeling indicates the currently projected mine activities at the Cordero Rojo Mine will be in compliance with the annual PM_{10} or NO_x ambient air standards for the life of the mine at the permitted mining rate of 65 mmtpy. The applicant currently proposes to mine at an average rate of 40 mmtpy during the time the Maysdorf LBA Tract would be mined.

Table 4-11 lists the three Class I areas and two Class II areas where the modeled impacts are the greatest. Table 4-11 includes a comparison to ambient air quality standards and PSD increments; however, it must be noted that this modeling analysis did not separate PSD increment-consuming sources from those that do not consume increment. The PSD-increment comparison is provided for informational purposes only and cannot be directly related to a regulatory interpretation of PSD increment consumption. For the Class I Northern Cheyenne Indian Reservation, modeled impacts for the baseline year (2002) and the two production scenarios for 2010 are less than the annual SO_2 PSD Class I increment, slightly above the PSD Class I increment levels for annual PM_{10}, annual NO_2, 24-hour SO_2, and 3-hour SO_2, and well above the Class I increments for 24-hour PM_{10}. In the other two Class I areas, only the 24-hour PM_{10} impacts are higher than the comparison to the PSD increment levels. In the sensitive Class II areas, all modeled impacts are well below the Class II PSD increments, except that the 24-hour PM_{10} impacts are greater than the Class II 24-hour PM_{10} increments at the Crow Indian Reservation.

The projected modeled visibility impacts for the baseline year (2002) and for the lower and upper coal production scenarios for 2010 for all analyzed Class I and sensitive Class II areas are listed in Table 4-12. For the baseline year, the maximum visibility impacts at Class I areas were determined to be at the Northern Cheyenne Indian Reservation in Montana and at Wind Cave and Badlands National Parks in South Dakota. For these locations, modeling showed more than 200 days of impacts with a change of 10 percent or more in extinction. A 10 percent change in extinction corresponds to 1.0 dv.

To provide a basis for discussing the modeled visibility impacts resulting from the projected increased production under the lower and upper coal production scenarios for 2010, the modeled visibility impacts for 2002 were subtracted from the model results for 2010. Table 4-12 shows the number of additional days that the projected impacts were greater than 1.0 dv (10 percent in extinction) for each site for the upper and lower coal production scenarios. Using Badlands Park as an example, the modeling projects 238 days with impacts greater than 1.0 dv in 2002.

Table 4-11. Maximum Predicted PSD Class I and Sensitive Class II Area Impacts (μg/m³)[1].

Location	Pollutant	Averaging Period	Base Year (2002) Impacts	2010 Lower Development Scenario	2010 Upper Development Scenario	PSD Class I/II Increments
			Class I Areas			
Northern Cheyenne Indian Reservation	NO_2	Annual	2.0	2.3	**2.7**	2.5
	SO_2	Annual	0.6	0.8	0.9	2
		24-hour	**6.1**	**6.5**	**6.9**	5
		3-hour	**26.8**	**27.9**	**29.3**	25
	PM_{10}	Annual	**5.0**	**5.8**	**7.0**	4
		24-hour	**42.0**	**47.8**	**59.4**	8
Washakie Wilderness Area	NO_2	Annual	0.1	0.1	0.1	2.5
	SO_2	Annual	0.0	0.1	0.1	2
		24-hour	1.0	3.0	3.3	5
		3-hour	2.0	5.1	5.6	25
	PM_{10}	Annual	0.3	0.4	0.4	4
		24-hour	**14.5**	**16.5**	**16.9**	8
Wind Cave National Park	NO_2	Annual	1.2	1.5	1.7	2.5
	SO_2	Annual	0.2	0.4	0.5	2
		24-hour	1.2	3.5	3.8	5
		3-hour	3.5	9.9	10.3	25
	PM_{10}	Annual	1.3	1.7	1.9	4
		24-hour	**10.7**	**14.0**	**15.7**	8
			Sensitive Class II Areas			
Crow Indian Reservation	NO_2	Annual	5.7	6.2	6.7	25
	SO_2	Annual	0.8	0.9	0.9	20
		24-hour	4.7	5.1	5.3	91
		3-hour	14.7	15.1	15.7	512
	PM_{10}	Annual	3.0	3.7	4.0	17
		24-hour	**30.5**	**35.1**	**36.7**	30
Cloud Peak Wilderness Area	NO_2	Annual	0.5	0.7	0.7	25
	SO_2	Annual	0.1	0.2	0.3	20
		24-hour	1.4	3.3	3.7	91
		3-hour	3.6	6.5	7.9	512
	PM_{10}	Annual	0.8	1.1	1.2	17
		24-hour	13.3	17.1	17.9	30

[1] The PSD demonstrations serve information purposes only and do not constitute a regulatory PSD increments consumption analysis.

Bold values indicate exceedance of PSD Class I or II standards.

Source: PRB Coal Review Task 3A Report (BLM 2006b)

Table 4-12. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas.

Location	2002 No. of Days >10%	2010 Lower Development Scenario Change in No. of Days > 10%	2010 Upper Development Scenario Change in No. of Days > 10%
Federally and Tribally Designated Class I Areas			
Badlands National Park	238	19	26
Bob Marshall WA	12	2	4
Bridger WA	47	4	7
Fitzpatrick WA	42	3	5
Fort Peck Indian Reservation	69	8	9
Gates of the Mountain WA	14	6	7
Grand Teton National Park	26	2	5
North Absaroka WA	47	6	6
North Cheyenne Indian Reservation	305	5	10
Red Rock Lakes	16	3	5
Scapegoat WA	14	4	4
Teton WA	40	4	5
Theodore Roosevelt National Park	98	15	22
UL Bend WA	49	4	5
Washakie WA	53	2	3
Wind Cave National Park	261	11	15
Yellowstone National Park	42	7	8
Sensitive Class II Areas			
Absaroka Beartooth WA	53	3	5
Agate Fossil Beds National Monument	199	26	30
Big Horn Canyon National Rec. Area	108	7	8
Black Elk WA	263	16	22
Cloud Peak WA	137	8	8
Crow Indian Reservation	284	10	15
Devils Tower National Monument	279	15	21
Fort Belknap Indian Reservation	46	3	4
Fort Laramie National Historic Site	153	27	30
Jedediah Smith WA	23	1	2
Jewel Cave National Monument	267	14	18
Lee Metcalf WA	25	2	4
Mount Naomi WA	8	6	8
Mount Rushmore National Monument	248	19	25
Popo Agie WA	47	7	8
Soldier Creek WA	223	23	29
Wellsville Mountain WA	6	5	7
Wind River Indian Reservation	66	12	15

Source: PRB Coal Review Task 3A Report (BLM 2006b)

Under the 2010 lower coal production scenario, the modeling projects an additional 19 days with impacts greater than 1.0 dv, or a total of 257 days with impacts greater than 1.0 dv.

For acid deposition, all predicted impacts are below the deposition threshold values for both nitrogen and sulfur compounds. There are substantial percentage increases in deposition under the lower and upper coal development scenarios for 2010; however, impacts remain well below the threshold values. The acid neutralizing capacity of sensitive lakes also was analyzed, and results are summarized in Table 4-13. The baseline year study indicated that none of the lakes had predicted significant impacts; however, the lower and upper development scenarios for 2010 show an increased impact at Florence Lake, leading to an impact that is above the 10 percent ANC. Impacts also are predicted to be above the 1 μeq/L threshold for Upper Frozen Lake.

The study also modeled impacts of selected hazardous air pollutant emissions (benzene, ethyl benzene, formaldehyde, n-hexane, toluene, and xylene) on the near-field receptors in Montana and Wyoming. Model results for the 2010 upper development scenario show that impacts were predicted to be above the acute Reference Exposure Level for formaldehyde (94 μg/m^3) at two receptors in Wyoming but are below all Reference Exposure and Reference Concentrations for Chronic Inhalation levels in Montana and for other compounds in Wyoming. Essentially, the modeled impacts for 2010 showed a continuation of the patterns exhibited for the baseline year analysis.

For 2015 and 2020, the PRB Coal Review Task 3A report includes a qualitative analysis of potential air quality impacts and the impacts from individual source groups, based on the projected changes from 2002 to 2010 for the respective production scenarios. The production from conventional oil and gas and CBNG activities is projected to peak at 2010, with slight declines predicted over the following decade. Therefore, from these sources, expected impacts would decrease slightly from2010 to 2015 and 2020. The coal mining sources would be the major contributors to PM_{10} impacts in the near-field, and these impacts would result from the proximity of the receptors to the coal mining operations. If coal mines expand or relocate, those impacts likely would follow that development; however, the specific impacts would need to be addressed with a more refined modeling effort, specifically including accurate source parameters. Power plants currently are the major contributors to all SO_2 impacts in the near-field in both states. However, the impacts are well below any ambient standard or PSD increment, and continued expansion should not jeopardize the attainment of those standards. Impacts on NO_2 concentrations are the result of emissions from all the source groups. No one source group dominates the NO_2 impacts in the near-field.

Table 4-13. Predicted Total Cumulative Change in Acid Neutralizing Capacity of Sensitive Lakes.

Location	Lake	Background ANC (µeq/L)	Area (hectares)	Base Year 2002 Change (percent)	2010 Lower Development Scenario Change (percent)	2010 Upper Development Scenario Change (percent)	Thresholds (percent)
Bridger Wilderness Area	Black Joe	67.0	890	1.3	1.88	1.97	10
	Deep	60.0	205	1.4	2.08	2.18	10
	Hobbs	70.0	293	0.9	1.37	1.43	10
	Upper Frozen	5.0	65	0.7[1]	0.99[1]	1.04[1]	1[1]
Cloud Peak	Emerald	55.3	293	5.3	6.59	6.89	10
	Florence	32.7	417	8.9	11.52	12.03	10
Fitzpatrick Wilderness Area	Ross	53.5	4,455	0.9	1.37	1.43	10
Popo Agie Wilderness Area	Lower Saddlebag	55.5	155	1.9	2.58	2.70	10

[1] Data for Upper Frozen Lake presented in changes in µeq/L rather than percent change. (For lakes with less than 25 µeq/L background ANC.)

Source: PRB Coal Review Task 3A Report (BLM 2006b)

A pattern that is similar to the near-field receptors also holds true for the Class I and sensitive Class II receptor groups. Essentially, the mine operations would continue to dominate the PM_{10} impacts, the power plants would continue to dominate the SO_2 impacts (although they would continue to be below the standards), and the overall source groups would continue to contribute to NO_2 impacts, but impacts should remain below the NO_2 standard.

Based on modeling results, none of the acid deposition thresholds were exceeded at Class I areas for either the baseline year or for the lower or upper development scenarios for 2010. In general, the projected increases in coal development (and power plants) are not expected to raise the deposition levels above the threshold, extended into 2020. The only concern relates to the acid deposition into sensitive lakes. The model results showed that the increased deposition, largely from SO_2 emissions from power plants, exceeded the thresholds of significance for the ANC at two sensitive (high alpine) lakes. The results indicate that with increased growth in power plant operations, the reduced ANC of the sensitive lakes would become significant and would need to be addressed carefully for each proposed major development project.

WDEQ/AQD and WDEQ/LQD mitigation and monitoring requirements for coal mine emissions are discussed in Sections 3.4.2.3 and 3.4.3.3. The discussion in these sections includes the operational control measures that are currently in place and would be required for mining operations on LBAs that are issued in the future, as well as measures that may be required to avoid future exceedances of the WAAQS and NAAQS and/or future mine-related impacts to the public.

4.2.4 Water Resources

Surface and groundwater are used extensively throughout the PRB for agricultural water supply, municipal water supply, and both domestic and industrial water supply. Surface water use is limited to major perennial drainages and agricultural areas within the basin are found mainly along these drainages. Municipal water supply comes from a combination of surface and groundwater. Domestic and industrial water supply primarily is from groundwater.

The PRB Coal Review Task 3B (Cumulative Water Effects) report is currently in preparation. This report, which will describe projected effects on ground and surface water as a result of projected development in the PRB, will be incorporated into future EIS analyses when it is complete. The analysis area for groundwater modeling (PRB Coal Review Task 3B report) is shown in Figure 4-4.

The PRB Coal Review used publicly available and accessible data and publications in the surface water and groundwater analyses. The two principal studies used were the Powder/Tongue River Basin study (HKM Engineering et al. 2002a) and the Northeast Wyoming River Basins study (HKM Engineering et al. 2002b). The Powder/Tongue River

Basin study includes the area drained by the Little Bighorn, Tongue, and Powder Rivers. The Belle Fourche and Cheyenne Rivers drain the area included in the Northeast Wyoming River Basins study.

4.2.4.1 Groundwater

There are five main aquifers in the Powder/Tongue River Basin study area and in the Wyoming portion of the Northeast Wyoming River Basin study area that can be used for water supply:

- Madison Aquifer System;
- Dakota Aquifer System;
- Fox Hills/Lance Aquifer System;
- Fort Union/Wasatch Aquifer System; and
- Quaternary Alluvial Aquifer System.

The Fort Union/Wasatch Aquifer System includes the coal and overburden aquifers that are directly affected by surface coal mining. It is a major source of local water supply for domestic and stock water use, and it is also the aquifer where the major pumpage from CBNG wells occurs. Table 4-14 shows the estimated recoverable groundwater in the components of the Fort Union/Wasatch Aquifer System. The volumes of recoverable groundwater from the sandstones within the Wasatch/Tongue River Aquifer, the Lebo Confining Layer, and the Tullock Aquifer were determined from the volume of sandstone in each of these unites multiplied by the 13 percent specific yield value for sandstone. Similarly, the volume of recoverable groundwater from the coals within the Wasatch/Tongue River was calculated from the volume of coal multiplied by the 0.4 percent specific yield value for coal.

As a result of statutory requirements and concerns, several studies and a number of modeling analyses have been conducted to help predict the impacts of surface coal mining on groundwater resources in the Wyoming portion of the PRB. Some of these studies and modeling analyses are discussed below.

In 1987, the USGS, in cooperation with the WDEQ and OSM, conducted a study of the hydrology of the eastern PRB. The resulting description of the cumulative hydrologic effects of all current and anticipated surface coal mining (as of 1987) was published in 1988 in the USGS Water-Resources Investigation Report entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming*", also known as the "USGS CHIA" (Martin et al. 1988). This report evaluates the potential cumulative groundwater impacts of surface coal mining in the area and is incorporated by reference into this EIS. The USGS CHIA analysis considered the proposed mining at the Caballo Rojo and Cordero Mines, which now comprise the Cordero Rojo Mine. It did not evaluate potential groundwater impacts related to additional coal leasing in this area and it did not consider the potential for overlapping groundwater impacts from coal mining and CBNG development.

Each mine must assess the probable hydrologic consequences of mining

Table 4-14. Recoverable Groundwater in the Fort Union/Wasatch Aquifer System.

Hydrogeologic Unit	Surface Area (acres)	Average Formation Thickness (ft)	Percentage of Sand/Coal	Average Sand/Coal Thickness (ft)	Specific Yield (percent)	Recoverable Groundwater (acre-feet)[1]
Wasatch-Tongue River Aquifer Sandstones	5,615,609	2,035	50.0	1,018	13.0	743,169,695
Wasatch-Tongue River Aquifer Coals	4,988,873	2,035	6.2	126	0.4	2,514,392
Lebo Confining Layer Sandstones	6,992,929	1,009	33.0	250	13.0	227,270,193
Tullock Aquifer Sandstones	7,999,682	1,110	52.0	430	13.0	447,182,224

[1] Calculated by multiplying Surface Area × Average Sand/Coal Thickness × Specific Yield. These numbers vary slightly from the numbers presented in Table 3-5 of the Final Environmental Impact Statement and Proposed Plan Amendment for the PRB Oil and Gas Project (BLM 2003b).

Source: BLM 2003b

as part of the mine permitting process. The WDEQ/LQD must evaluate the cumulative hydrologic impacts associated with each proposed mining operation before approving the mining and reclamation plan for each mine, and they must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside of the permit area for each mine. As a result of these requirements, each existing approved mining permit includes an analysis of the hydrologic impacts of the surface coal mining proposed at that mine. If revisions to mining and reclamation permits are proposed, then the potential cumulative impacts of the revisions must also be evaluated. If the Maysdorf LBA Tract is leased to the applicant, the existing mining and reclamation permit for the Cordero Rojo Mine must be revised and approved to include the new lease before it can be mined.

The PRB Oil and Gas Project FEIS (BLM 2003b) includes a modeling analysis of the groundwater impacts if an additional 39,000 new CBNG wells are drilled in the PRB by the end of 2011. The project area for this EIS, which covers all of Campbell, Sheridan, and Johnson Counties, as well as the northern portion of Converse County, is similar to the study area for the PRB Coal Review Task 1 and Task 2 study area.

Another source of data on the impacts of surface coal mining on groundwater is the monitoring that is required by WDEQ/LQD and administered by the mining operators. Each mine is required to monitor groundwater levels and quality in the coal and in the shallower aquifers in the area surrounding their operations. Monitoring wells are also required to record water levels and water quality in reclaimed areas.

The coal mine groundwater monitoring data are published each year by GAGMO, a voluntary group formed in 1980. Members of GAGMO include most of the companies with operating or proposed mines in the Wyoming PRB, WDEQ, the Wyoming SEO, BLM, USGS, and OSM. GAGMO contracts with an independent firm each year to publish the annual monitoring results. In 1991, GAGMO published a report summarizing the water monitoring data collected from 1980 to 1990 in the Wyoming PRB (Hydro-Engineering 1991). In 1996, they published a report summarizing the data collected from 1980 to 1995 (Hydro-Engineering 1996). In 2001, GAGMO published a report summarizing the water monitoring data collected from 1980 to 2000 (Hydro-Engineering 2001).

The major groundwater issues related to surface coal mining that have been identified are:

- the effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with backfill material;
- the extent of the temporary lowering of static water levels in the aquifers around the mine due to dewatering associated with removal of these aquifers within the mine boundaries;
- the effects of the use of water from the subcoal Fort Union Formation by the mines;
- changes in water quality as a result of mining; and
- potential overlapping drawdown due to proximity of coal mining and CBNG development.

The impacts of large scale surface coal mining on a cumulative basis for each of these issues are discussed in the following paragraphs.

The effect of replacing the coal and overburden with backfill is the first major groundwater concern. The following discussion of recharge, movement, and discharge of water in the backfill aquifer is excerpted from the USGS CHIA (Martin et al. 1988):

> Postmining recharge, movement, and discharge of groundwater in the Wasatch aquifer and Wyodak coal aquifer will probably not be substantially different from premining conditions. Recharge rates and mechanisms will not change substantially. Hydraulic conductivity of the spoil aquifer will be approximately the same as in the Wyodak coal aquifer allowing groundwater to move from recharge areas where clinker is present east of mine areas through the spoil aquifer to the undisturbed Wasatch aquifer and Wyodak coal aquifer to the west.

Monitoring data verify that recharge has occurred and is continuing in the backfill (Hydro-Engineering 1991, 1996, 2001, and 2004). The water monitoring summary reports prepared each year by GAGMO list current water levels in the monitoring wells completed in the backfill and compare them with the 1980 water levels, as estimated from the 1980 coal water-level contour maps. In the 1991 GAGMO 10-year report, some recharge had occurred in 88 percent of the 51 backfill wells reported at that time (Hydro-Engineering 1991). In the GAGMO 20-year report, 79 percent of the 82 backfill wells measured contained water (Hydro-Engineering 2001).

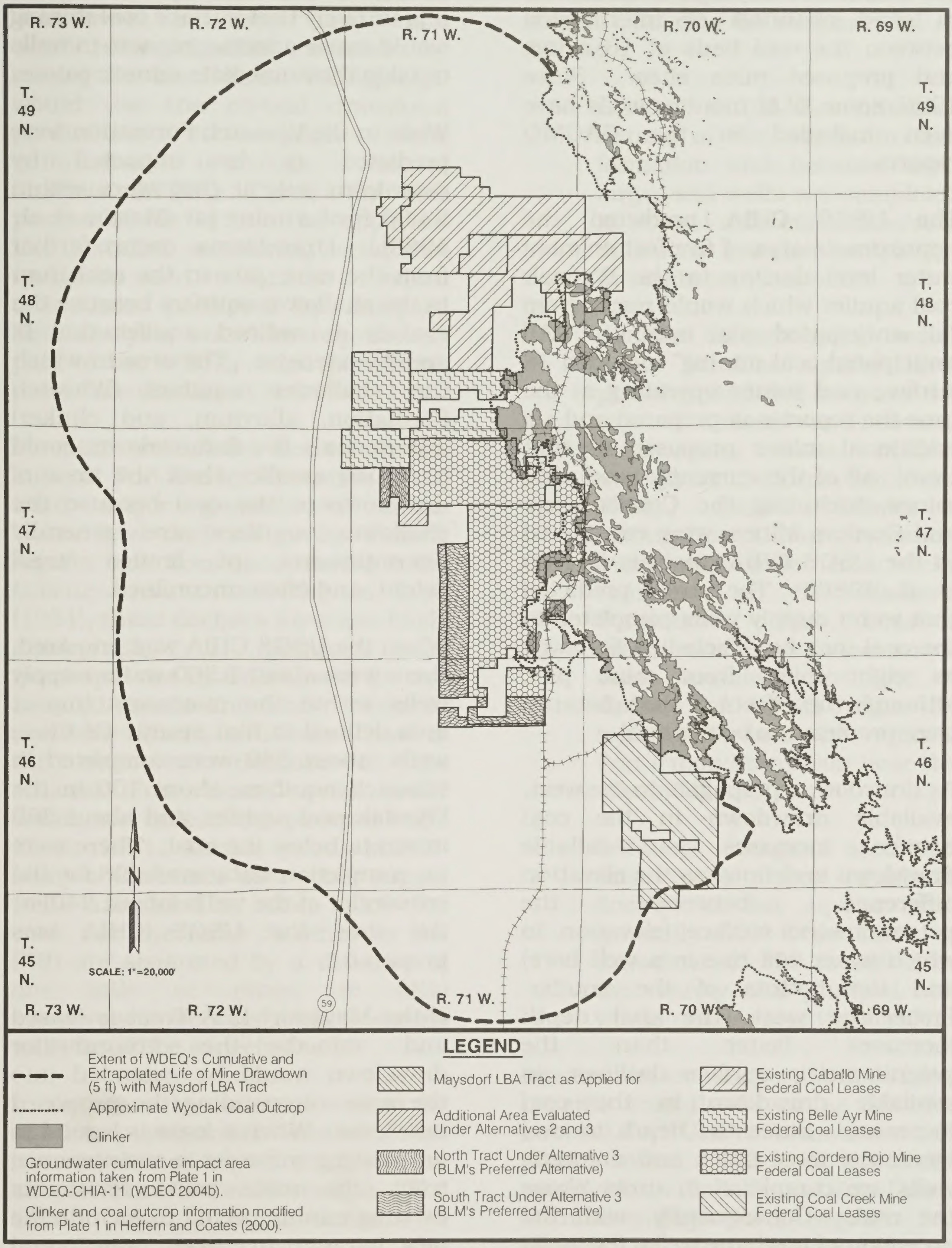
Coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by mining.

The cumulative size of the backfill area in the PRB and the duration of mining activity would be increased by mining the recently issued leases and the currently proposed LBA tracts, including the Maysdorf LBA Tract. Since the mined-out areas are being backfilled and the monitoring data demonstrate that recharge of the backfill is occurring, substantial additional impacts are not anticipated as a result of any of the pending leasing actions.

Clinker or scoria, the baked and fused rock formed by prehistoric burning of the Wyodak-Anderson coal seam, occurs all along the coal outcrop area (Figure 3-11) and is believed to be the major recharge source for the backfill aquifer, just as it is for the coal. However, not all clinker is saturated. Some clinker is mined for road-surfacing material, but saturated clinker is not generally mined since abundant clinker exists above the water table and does not present the mining problems that would result from mining saturated clinker. Therefore, the major recharge source for the backfill aquifer is not being disturbed by current mining. Clinker is not present on the Maysdorf LBA Tract.

The second major groundwater issue is the extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines. In general, the limited extent of the saturated sand aquifers in the Wasatch Formation overburden dictates that drawdowns in the Wasatch Formation are much smaller and cover much less area than the coal drawdowns. In this EIS, assessment of cumulative impacts to groundwater related to surface coal mining is based on impact predictions made by the Cordero Rojo Mine and the other adjacent mines (Coal Creek, Belle Ayr, and Caballo Mines). Those drawdowns are extrapolated to consider mining of the Maysdorf LBA Tract. Figure 4-5 depicts the extrapolated extent of the five-ft cumulative drawdown contour within the Wyodak coal aquifer resulting from the four mines in the South Gillette subregion. The extent of the five-ft drawdown contour is used by WDEQ/LQD to assess the cumulative extent of the impact to the groundwater system caused by mining operations.

The GAGMO 20-year report provides actual groundwater drawdown information after 20 years of mining (Hydro-Engineering 2001). Most of the monitoring wells included in the GAGMO 20-year report (488 wells out of 570) are completed in the coal


R. 73 W.
R. 72 W.
R. 71 W.
R. 70 W.
R. 69 W.
T. 49 N.
T. 48 N.
T. 47 N.
T. 46 N.
T. 45 N.
59
SCALE: 1"=20,000'
LEGEND
Extent of WDEQ's Cumulative and Extrapolated Life of Mine Drawdown (5 ft) with Maysdorf LBA Tract
Approximate Wyodak Coal Outcrop
Clinker
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
Existing Caballo Mine Federal Coal Leases
Existing Belle Ayr Mine Federal Coal Leases
Existing Cordero Rojo Mine Federal Coal Leases
Existing Coal Creek Mine Federal Coal Leases

Groundwater cumulative impact area information taken from Plate 1 in WDEQ-CHIA-11 (WDEQ 2004b).

Clinker and coal outcrop information modified from Plate 1 in Heffern and Coates (2000).

Figure 4-5. Extrapolated Extent of Cumulative Drawdown Within the Wyodak Coal Aquifer in the South Gillette Subregion.

beds, in the overlying sediments, or in sand channels or interburden between the coal beds at 16 active and proposed mine sites. Since 1996, some BLM monitor wells have been included in the GAGMO reports.

The USGS CHIA predicted the approximate area of five feet or more water level decline in the Wyodak coal aquifer which would result from "all anticipated coal mining". "All anticipated coal mining" included 16 surface coal mines operating at the time the report was prepared and six additional mines proposed at that time. All of the currently producing mines, including the Caballo Rojo and Cordero Mines, were considered in the USGS CHIA analysis (Martin et al. 1988). The study predicted that water supply wells completed in the coal may be affected as far away as eight miles from mine pits, although the effects at that distance were predicted to be minimal.

As drawdowns propagate to the west, available drawdown in the coal aquifer increases. Available drawdown is defined as the elevation difference between the potentiometric surface (elevation to which water will rise in a well bore) and the bottom of the aquifer. Proceeding west, the coal depth increases faster than the potentiometric surface declines, so available drawdown in the coal increases. Since the depth to coal increases, most stock and domestic wells are completed in units above the coal. Consequently, with the exception of methane wells, few wells are completed in the coal in the areas west of the mines. Those wells completed in the coal have considerable available drawdown, so it is unlikely that surface coal mining would cause adverse impacts to wells outside the immediate mine area.

Wells in the Wasatch Formation were predicted to be impacted by drawdown only if they were within 2,000 ft of a mine pit (Martin et al. 1988). Drawdowns occur farther from the mine pits in the coal than in the shallower aquifers because the coal is a confined aquifer that is areally extensive. The area in which the shallower aquifers (Wasatch Formation, alluvium, and clinker) experience a five-ft drawdown would be much smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous, of limited areal extent, and often unconfined.

When the USGS CHIA was prepared, there were about 1,200 water supply wells within the maximum impact area defined in that study. Of those wells, about 580 were completed in Wasatch aquifers, about 100 in the Wyodak coal aquifer, and about 280 in strata below the coal. There were no completion data available for the remainder of the wells (about 240) at the time the USGS CHIA was prepared.

If the Maysdorf LBA Tract is leased and mined, the groundwater drawdown would be extended into the area surrounding the proposed new lease. When a lease is issued to an existing mine for a maintenance tract, the mine must revise its existing mining permit to include the new tract in its mine and reclamation plans. In order to do that, the lessee would be required to conduct a detailed groundwater analysis to predict the extent of drawdown in the coal and overburden aquifers caused by mining the new lease. WDEQ/LQD would use the revised drawdown predictions to update their cumulative hydrologic impact analysis (WDEQ CHIA) for this portion of the PRB. The applicant has installed monitoring wells that would be used to confirm or refute drawdowns predicted by analysis. This analysis would be required as part of the WDEQ mine permitting procedure discussed in Section 1.2.

Potential water-level decline in the subcoal Fort Union Formation is the third major groundwater issue. Water level declines in the Tullock Aquifer have been documented in the Gillette area. According to Crist (1991), these declines are most likely attributable to pumpage for municipal use by Gillette and for use at subdivisions and trailer parks in and near the city of Gillette. Most of the water-level declines in the subcoal Fort Union wells occur within one mile of the pumped wells (Crist 1991, Martin et al. 1988). Many of the mines have water supply wells completed in zones below the coal, but the mine facilities in the PRB are separated by a distance of one mile or more, so little interference between mine supply wells would be expected.

In response to concerns voiced by regulatory personnel, several mines have conducted impact studies of the subcoal Fort Union Formation. The OSM also commissioned a cumulative impact study of the subcoal Fort Union Formation to address the effects of mine facility wells on this aquifer (OSM 1984). Conclusions from these studies are similar and may be summarized as follows:

- Because of the discontinuous nature of the sands in this formation and because most large-yield wells are completed in several different sands, it is difficult to correlate completion intervals between wells.
- In the Gillette area, water levels in this aquifer have probably declined because the city of Gillette and several subdivisions have utilized water from the formation (Crist 1991). (Note: Gillette is mixing Fort Union Formation water with water from wells completed in the Madison Formation. Also, because drawdowns have occurred, some operators are able to dispose of CBNG water by injecting it into the subcoal Fort Union Formation near the city of Gillette.)
- Because large saturated thicknesses are available (locally) in this aquifer unit, generally 500 ft or more, a drawdown of 100 to 200 ft in the vicinity of a pumped well would not dewater the aquifer.

Most of the existing coal mines have permits from the Wyoming SEO for subcoal Fort Union Formation water supply wells. CMC uses four wells completed in the sub-coal Fort Union Formation (Rojo No. 1, Rojo No. 2A, PW-24-1-P, and PW-24-2-P) to supply water for human consumption and mining operations (Figure 3-10). The mine also has one well completed in the Fox Hills Sandstone, which is the lower portion of the Lance Formation. The Lance Formation lies beneath the Fort Union Formation in the PRB. Extending the life of the Cordero Rojo Mine by issuing a new lease would result in additional water being withdrawn from the subcoal Fort Union Formation, but no new sub-coal water supply wells would be required. The additional water withdrawal would not be expected to extend the area of water level drawdown over a substantially larger area due to the discontinuous nature of the sands in the Tullock Member and the fact that drawdown and yield reach equilibrium in a well due to recharge effects. Due to the distances separating subcoal Fort Union Formation wells used for mine water supply, these wells have not experienced interference and are not likely to in the future.

Water requirements and sources for the proposed Two Elk power plant near the Black Thunder Mine are not currently known. The Wyoming SEO is discouraging further development of the lower Fort Union Formation aquifers, so the most likely groundwater source for Two Elk power plant is the Lance-Fox Hills Aquifer System. This would reduce the chances that the power plants would add to cumulative hydrologic impacts of mining.

The fourth issue of concern with groundwater is the effect of mining on water quality. Specifically, what effect does mining have on the water quality in the surrounding area, and what are the potential water quality problems in the backfill aquifer following mining?

In a regional study of the cumulative impacts of coal mining, the median concentrations of dissolved solids and sulfates were found to be higher in water from backfill aquifers than in water from either the Wasatch Formation overburden or the Wyodak coal aquifer (Martin et al. 1988). This is expected because blasting and movement of the overburden materials exposes more surface area to water, increasing dissolution of soluble materials, particularly from the overburden materials that were situated above the saturated zone in the premining environment.

One pore volume of water is the volume of water that would be required to saturate the backfill following reclamation. The time required for one pore volume of water to pass through the backfill aquifer is greater than the time required for the postmining groundwater system to reestablish equilibrium. According to the USGS CHIA, estimates of the time required to reestablish equilibrium range from tens to hundreds of years (Martin et al. 1988).

The major current use of water from the aquifers being replaced by the backfill (the Wasatch Formation overburden and Wyodak coal aquifers) is for livestock because these aquifers are typically too high in dissolved solids for domestic use and well yields are typically too low for irrigation (Martin et al. 1988). Chemical analyses of 336 samples collected between 1981 and 1986 from 45 wells completed in backfill aquifers at 10 mines indicated that the quality of water in the backfill will, in general, meet the state standard for livestock use of 5,000 mg/L for TDS when recharge occurs (Martin et al. 1988). The 2000 annual GAGMO report (Hydro-Engineering 2000) evaluated samples from 48 backfill wells in 1999 and found that 75 percent were less than 5,000 mg/L, TDS in 23 percent were between 5,000 and 10,000 mg/L, and TDS in one well was above 10,000 mg/L. An analysis of about 2,000 samples collected from 95 backfill monitoring wells between 1986 and 2002 found that the water quality in 75 percent of the wells were within the acceptable range for the Wyoming livestock standard, with 25 percent exceeding that standard (Ogle 2004). Water quality data for the backfill aquifer for the mines in the South Gillette subregion (Caballo, Belle Ayr, Cordero Rojo, and Coal Creek) for the period from 1977 to 2004 was compiled by WDEQ/LQD and presented in the most recently prepared WDEQ CHIA for that mine group (Ogle et al. 2005). The median TDS concentration of groundwater from the backfill aquifer in that group of mines was 3,293 mg/L. As indicated by these studies, the data collected since the preparation of the USGS CHIA support the conclusion that water from the backfill will generally be acceptable for its current use, which is livestock watering, even before equilibrium is established. The incremental effect on groundwater quality due to leasing and mining the Maysdorf LBA Tract would be to increase the total volume of backfill and, thus, the time for equilibrium to reestablish.

The fifth area of concern is the potential for cumulative impacts to groundwater resources due to the proximity of coal mining and CBNG development. The Wyodak coal is being developed by mining and CBNG production in the same general area. Dewatering activities associated with CBNG development have overlapped with and expanded the area of groundwater drawdown in the coal aquifer in the PRB over what would occur due to coal mining development alone, and this would be expected to continue.

Numerical groundwater flow modeling was used to predict the impacts of the cumulative stresses imposed by mining and CBNG development on the Fort Union Formation coal aquifer in the PRB Oil and Gas Project EIS (BLM 2003b). Modeling was necessary because of the large areal extent, variability, and cumulative stresses imposed by mining and CBNG development on the Fort Union coal aquifers. Information from earlier studies was incorporated into the modeling effort for this analysis.

As expected, the modeling has indicated that the groundwater impacts from CBNG development and surface coal mining would be additive in nature and that the addition of CBNG development would extend the area experiencing a loss in hydraulic head to the west of the mining area. The 20-year GAGMO report stated that drawdowns in all areas have greatly increased in the last few years due to the water production from the Wyodak coal aquifer by CBNG producers (Hydro-Engineering 2001).

Drawdowns in the coal caused by CBNG development would be expected to reduce the need for dewatering in advance of mining, which would be beneficial for mining operations. Wells completed in the coal may also experience increased methane emissions in areas of significant aquifer depressurization. There would be a potential for conflicts to occur over who (coal mining or CBNG operators) is responsible for replacing or repairing private wells that are adversely affected by the drawdowns; however, the number of potentially affected wells completed in the coal is not large.

As discussed previously, coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by coal mining. In response to concerns about the potential impacts of CBNG development on water rights, a group of CBNG operators and local landowners developed a standard water well monitoring and mitigation agreement that can be used on a case-by-case basis as development proceeds. All CBNG operators on federal oil and gas leases are required to offer this water well agreement to the surface landowners (BLM 2003b).

After CBNG development and coal mining projects are completed, it will take longer for groundwater levels to recover due to the overlapping drawdown impacts caused by the dewatering and depressuring of the coal aquifer by both operations.

4.2.4.2 Surface Water

The main rivers in the Powder/Tongue River Basin are the Tongue River and the Powder River. The Powder/Tongue River Basin receives substantial surface water runoff from the Big Horn Mountains, leading to major agricultural development along drainages in the Tongue River and Powder River basins. Reservoirs are used throughout the basin for agricultural water supply and for municipal water supply in the Powder/Tongue River Basin. Water use in the Powder/Tongue River Basin as of 2002 is summarized in Table 4-15.

The Little Bighorn River, Tongue River, Powder River, Crazy Woman Creek, and Piney Creek carry the largest natural flows in the Powder/Tongue River Basin. Many of the other major drainages are affected by irrigation practices to the extent that their flows are not natural (HKM Engineering et al. 2002a). Water availability in the major sub-basins of the Powder/Tongue River Basin is summarized in Table 4-16. This table presents the amount of surface water in acre-feet that is physically available above and beyond allocated surface water in these drainages. As a result of the Yellowstone River Compact, Wyoming must share some of the physically available surface water in the Powder/Tongue River Basin with Montana.

The main rivers in the Northeast Wyoming River Basins are the Belle Fourche in Campbell and Crook Counties and the Cheyenne River in Converse, Weston, and Niobrara Counties. Water in these rivers and their tributaries comes from groundwater baseline flow and from precipitation, especially from heavy storms during the summer months.

Table 4-15. Water Use as of 2002 in the Powder/Tongue River Basin.

Water Use Categories	Dry Year Surface Water	Dry Year Groundwater	Normal Year (acre-feet per year) Surface Water	Normal Year Groundwater	Wet Year Surface Water	Wet Year Groundwater
Agricultural	178,000	200	184,000	200	194,000	300
Municipal	2,700	500	2,700	500	2,700	500
Domestic	---	4,400	---	4,400	---	4,400
Industrial[1]	---	68,000	---	68,000	---	68,000
Recreation			Non-consumptive			
Environmental			Non-consumptive			
Evaporation	11,300	--	11,300	--	11,300	--
Total	**192,000**	**73,100**	**198,000**	**73,100**	**208,000**	**73,200**

[1] Includes conventional oil and gas production water and CBNG production water.
Source: HKM Engineering et al. 2002a

Table 4-16. Surface Water Availability in the Powder/Tongue River Basin.

Sub-basin	Surface Water Availability (acre-feet per year) Wet Years	Normal Years	Dry Years
Little Bighorn River	152,000	113,000	81,000
Tongue River	473,000	326,000	218,000
Clear Creek	213,000	124,000	80,000
Crazy Woman Creek	69,000	32,000	16,000
Powder River	547,000	324,000	16,000
Little Powder River	48,000	12,000	3,000
Total	**1,502,000**	**931,000**	**414,000**

Source: HKM Engineering et al. 2002a

Water use in the Northeast Wyoming River Basins as of 2002 is summarized in Table 4-17.

Stream flow in the major drainages of the Northeast Wyoming River Basins is much less than in the Powder/Tongue River Basin, due to the absence of a major mountain range to provide snow melt runoff. Water availability in the major sub-basins of the Northeast Wyoming Rivers Basin is summarized in Table 4-18.

The surface water resources in the PRB Coal Review Task 3 study area consist primarily of intermittent and ephemeral streams and scattered ponds and reservoirs. The major impact of the projected development activities would be direct surface disturbance of these surface water features. Table 4-9 summarizes the cumulative baseline (2003) and projected (in 2010, 2015, and 2020) acres of surface disturbance and reclamation. The projected activities would result in surface disturbance in each of the six Task 3 study area subwatersheds (Figure 4-4). Discrete locations for development disturbance and reclamation areas cannot be determined based on existing information. However, the projected disturbance would primarily involve the construction of additional linear facilities, product gathering lines, and road systems associated with conventional oil and gas and CBNG activities, plus additional disturbance associated with extending coal mining operations onto lands adjacent to the existing mines.

Table 4-17. Water Use as of 2002 in the Northeast Wyoming River Basins.

	Dry Year		Normal Year (acre-feet per year)		Wet Year	
Water Use Categories	**Surface Water**	**Ground-water**	**Surface Water**	**Ground-water**	**Surface Water**	**Ground-water**
Agricultural	65,000	11,000	69,000	17,000	71,000	17,000
Municipal	---	9,100	---	9,100	---	9,100
Domestic	---	3,600	---	3,600	---	3,600
Industrial (Oil and Gas)	---	46,000	---	46,000	---	46,000
Industrial (Other)	---	4,700	---	4,700	---	4,700
Recreation	Non-consumptive					
Environmental	Non-consumptive					
Evaporation (Key Reservoirs)	14,000	---	14,000	---	14,000	---
Evaporation (Stock Ponds)	6,300	---	6,300	---	6,300	---
Total	**85,300**	**74,400**	**89,300**	**80,400**	**91,300**	**80,400**

[1] Includes conventional oil and gas production water and CBNG production water.

[2] Includes electricity generation, coal mining, and oil refining.

Source: HKM Engineering et al. 2002b

Table 4-18. Surface Water Availability in the Northeast Wyoming River Basins.

	Surface Water Availability (acre-feet per year)		
Sub-basin	**Wet Years**	**Normal Years**	**Dry Years**
Redwater Creek	34,000	26,000	17,000
Beaver Creek	30,000	20,000	14,000
Cheyenne River	103,000	31,000	5,000
Belle Fourche River	151,000	71,000	13,000
Total	**318,000**	**148,000**	**49,000**

Source: HKM Engineering et al. 2002b

Future coal mining could remove intermittent or ephemeral streams and stock ponds in the Little Powder River, Upper Belle Fourche River, Upper Cheyenne River, and Antelope Creek subwatersheds. Coal mine permits provide for removal of first- through fourth-order drainages. During reclamation, third- and fourth-order drainages must be restored; first- and second-order drainages often are not replaced (Martin et al. 1988).

Coal mining-related surface water would be discharged into intermittent and ephemeral streams in these same four subwatersheds (Antelope Creek, Little Powder River, Upper Belle Fourche River, and Upper Cheyenne River). Based on current trends, it is assumed that most, if not all, of the coal mine-produced water would be consumed during operation. As discussed in Section 3.5.2.2, changes in surface runoff would occur as a result of the destruction and reconstruction of drainage channels as mining progresses. Sediment control structures would be used to manage discharges of surface water from the mine permit areas. State and federal regulations require treatment of surface runoff from mined lands to meet effluent standards.

The PRB Coal Review assumes that future permitting would allow a portion of CBNG-produced water to be discharged to intermittent and ephemeral drainages as is currently allowed in the six subwatersheds in the PRB Coal Review Task 3 study area. It is estimated that up to 39,108, 41,899, and 37,390 mmgpy of water would be produced in 2010, 2015, and 2020, respectively. Based on past monitoring in receiving streams, no change in surface flows would be expected beyond approximately two miles from the discharge points (BLM 2003b). Water discharged from CBNG wells has supplied the Belle Fourche River and some tributaries, ponds, and playas with water nearly continuously for several years, but this reach of the Belle Fourche River has not become perennial, even with the addition of CBNG discharge water.

Surface disturbing activities can result in sediment input to water bodies, which affects water quality parameters such as turbidity and bottom substrate composition. Contaminants also can be introduced into water bodies through chemical characteristics of the sediment. Studies have shown that TDS levels in streams near reclaimed coal mine areas have increased from one percent to seven percent (Martin et al. 1988). Typically, sedimentation effects are short-term in duration and localized in terms of the affected area. Suspended sediment concentrations would stabilize and return to typical background concentrations after construction or development activities have been completed. It is anticipated that sediment input associated with development disturbance areas would be minimized by implementation of appropriate erosion control measures, as would be determined during future permitting.

4.2.5 Alluvial Valley Floors

Currently identified AVFs for all coal mines in the PRB Coal Review study area are described in the PRB Coal Review Task 1D Report (BLM 2005c), based on individual mine State Decision Documents. Regulatory determinations of AVF occurrence and location are completed as part of the permitting process for coal mining operations, because their presence can restrict mining activities under SMCRA and Wyoming laws. The WDEQ/LQD administers the AVF regulations for coal mining activities in Wyoming. Coal mine-related impacts to designated AVFs generally are not permitted if the AVF is determined to be significant to agriculture. If an AVF is determined not to be significant to agriculture or if the permit to affect the AVF was approved prior to the effective date of SMCRA, the AVF can be disturbed during mining but must be restored to essential hydrologic function during reclamation. The portions of the PRB Coal Review Task 3 study area that are outside of the mine permit areas have generally not been surveyed for the presence of AVFs;

therefore, the locations and extent of the AVFs outside of the mine permit areas have not been determined.

The formal AVF designation and related regulatory programs described above are specific to coal mining operations; however, other development-related activities in the study area would potentially impact AVF resources.

4.2.6 Soils

The PRB Coal Review Task 3D Report (BLM 2005f) discusses potential cumulative impacts to soils as a result of projected development activities in the PRB Coal Review Task 3 study area. The baseline year (2003) area of disturbance and reclamation and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 related to surface coal mining are shown in Tables 4-2 and 4-3. The baseline year area of disturbance and reclamation and the projected cumulative total areas of disturbance and reclamation for all projected development for 2010, 2015, and 2020 are shown in Table 4-9.

Development activities such as increased vehicle traffic, vegetation removal, soil salvage and redistribution, discharge of CBNG produced groundwater, and construction and maintenance of project-specific components (e.g., roads, ROWs, well pads, industrial sites, and associated ancillary facilities) would result in cumulative impacts to soils in the study area. In general, soil disturbance and handling from these activities would generate both long-term and short-term impacts to soil resources through accelerated wind or water erosion, other declining soil quality factors, compaction, and the essentially permanent removal of soil resources at industrial sites.

Of the types of development projects in the study area, coal mining activities would create the most concentrated cumulative impacts to soils. This is due to the large acreages involved and the tendency of mining operations to occur in contiguous blocks. These factors would encourage widespread accelerated wind and water erosion; extensive soil handling would reduce soil quality through compaction and corresponding loss of permeability to water and air; declining microbial populations, fertility, and organic matter; potential mixing of saline and/or alkaline soil zones into seedbeds; and the limited availability of suitable soil resources for reclamation uses in some areas.

However, for surface coal mining operations, there are measures that are either routinely required or can be specifically required as necessary to reduce impacts to soil resources and to identify overburden material that may be unsuitable for use in reestablishing vegetation, as discussed in Sections 3.3.1.3, 3.4.2.3, and 3.8.3.

As described in Appendix E of the PRB Coal Review Task 2 Report (BLM 2005d), a variety of CBNG water disposal methods may be employed in the Task 3 study area. The potential impacts to soils would depend on the water treatment method, if any, and the nature of the disposal method. As discussed in the PRB Coal Review Task 3D Report (BLM 2005f), due to elevated SAR levels in water produced from the Wyodak-Anderson coal zone in the Upper Powder River and Little Powder River subwatersheds, land applications of CBNG-produced water in those areas could increase soil alkalinity. Although elevated SARs are also observed in CBNG-produced waters in the Upper Belle Fourche River subwatershed, land application of CBNG-produced water is not anticipated there. The specific approaches to CBNG water discharges, the resource conditions and locations in which they occur, the timing of discharges, and the discharge permit stipulations from regulatory and land management agencies would determine the extent and degree of potential impacts to soils.

4.2.7 Vegetation, Wetlands and Riparian Areas

The PRB Coal Review Task 3D Report (BLM 2005f) discusses potential cumulative impacts to vegetation, wetlands, and riparian areas as a result of projected development activities in the PRB Coal Review Task 3 study area. The baseline year (2003) area of disturbance and reclamation and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 related to surface coal mining are shown in Tables 4-2 and 4-3. The baseline year area of disturbance and reclamation and the projected cumulative total areas of disturbance and reclamation for all projected development for 2010, 2015, and 2020 are shown in Table 4-9.

4.2.7.1 Vegetation

The PRB is characterized as a mosaic of general vegetation types, which include prairie grasslands, shrublands, forested areas, and riparian areas. These broad categories often represent several vegetation types that are similar in terms of dominant species and ecological importance. Fourteen vegetation types were identified within the PRB Coal Review Task 1 study area, of which 10 primarily consist of native vegetation and are collectively classified as rangeland. These vegetation types include short-grass prairie, mixed-grass prairie, sagebrush shrubland, other shrubland, coniferous forest, aspen, forested riparian, shrubby riparian, herbaceous riparian, and wet meadow. The remaining vegetation types support limited or non-native vegetation and include cropland, urban/disturbed, barren, and open water. The vegetation types are described in more detail in the Task 1D Report for the PRB Coal Review (BLM 2005c).

Impacts to vegetation can be classified as short-term and long-term. Potential short-term impacts arise from the removal and disturbance of herbaceous species during a project's development and operation (e.g., coal mines, CBNG wells, etc.), which would cease upon project completion and successful reclamation in a given area. Reclaimed mine land is defined by WDEQ/LQD as affected land that has been backfilled, graded, topsoiled, and permanently seeded in accordance with the approved practices specified in the reclamation plan (Christensen 2002). Species composition on the reclaimed lands may be different than on the surrounding undisturbed lands. The removal of woody species would be considered a long-term impact since these species take approximately 25 years or longer to attain a size comparable to woody species present within proposed disturbance areas. Potential long-term impacts would also include permanent loss of vegetation and vegetative productivity in areas that would not be reclaimed in the near term (e.g., power plant sites).

4.2.7.2 Special Status Plant Species

Special status plant species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species (species that are protected under the ESA), BLM Sensitive Species, USDA-FS Sensitive Species, and WGFD Species of Special Concern in Wyoming. Further discussions of species that are protected under the ESA and BLM Sensitive Species are included in Appendices F and G of this EIS. One federally listed species (Ute ladies'-tresses orchid) and one USDA-FS sensitive species (Barr's milkvetch) are known to occur in the PRB Coal Review Task 3 study area. Three BLM sensitive species [Nelson's milkvetch and Laramie columbine (Casper Field Office) and William's wafer-parsnip (Buffalo Field Office)] may occur in the PRB Coal Review Task 3 study area.

Potential direct impacts to special status plant species in the study area could include the incremental loss or alteration of potential or known habitat, associated with past and projected activities. Direct impacts also could include the direct loss of individual plants within the PRB Coal Review Task 3 study area, depending on their location in relation to development activities. Indirect impacts could occur due to increased dispersal and establishment of noxious weeds, which may result in the displacement of special status plant species in the long term.

4.2.7.3 Noxious and Invasive Weed Species

Once established, invasive and non-native plant species can outcompete and eventually replace native species, thereby reducing forage productivity and the overall vigor of existing native plant communities. The State of Wyoming has designated the following 25 plant species as noxious weeds:

- Field bindweed (*Convolvulus arvensis*)
- Canada thistle (*Cirsium arvense*)
- Leafy spurge (*Euphorbia esula*)
- Perennial sowthistle (*Sonchus arvensis*)
- Quackgrass (*Agropyron repens*)
- Hoary cress (*Cardaria draba*)
- Hairy whitetop (*Cardaria pubescens*)
- Perennial pepperweed (giant whitetop) (*Lepidium latifolium*)
- Ox-eye daisy (*Chrysanthemum leucanthemum*)
- Skeletonleaf bursage (*Franseria discolor Nutt.*)
- Russian knapweed (*Centaurea repens L.*)
- Yellow toadflax (*Linaria*

vulgaris)
- Dalmatian toadflax (*Linaria dalmatica*)
- Scotch thistle (*Onopordum acanthium*)
- Musk thistle (*Carduus nutans*)
- Common burdock (*Arctium minus*)
- Plumeless thistle (*Carduus acanthoides*)
- Dyers woad (*Isatis tinctoria*)
- Houndstongue (*Cynoglossum officinale*)
- Spotted knapweed (*Centaurea maculosa Lam.*)
- Diffuse knapweed (*Centaurea diffusa Lam.*)
- Purple loosestrife (*Lythrum salicaria L.*)
- Saltcedar (*Tamarix spp.*)
- Common St. Johnswort (*Hypericum perforatum*)
- Common Tansy (*Tanacetum vulgare*)

Campbell County does not have a declared list of weeds

Development-related construction and operation activities would potentially result in the dispersal of noxious and invasive weed species within and beyond the surface disturbance boundaries, which would result in the displacement of native species and changes in species composition in the long term. The potential for these impacts would be higher in relation to the development of linear facilities (e.g., pipeline ROWs, oil- and gas-related road systems, etc.) than for site facilities (e.g., mines, power plants, etc.) due to the potential for dispersal of noxious weeds over a larger area. Chapter 4, Section 2(d)(xiv) of the WDEQ/LQD rules and regulations requires that surface coal mines address weed control on reclaimed areas as follows:

> The operator must control and minimize the introduction of noxious weeds in accordance with Federal and State requirements until bond release.

Accordingly, the reclamation plans for the existing Cordero Rojo Mine and for all other surface coal mines in the Wyoming PRB include steps to control invasion by weedy (invasive nonnative) plant species. Specific measures that are used to identify and control noxious weeds at the Cordero Rojo Mine are discussed in Chapter 3, Section 3.9.4. Similar measures to identify and control noxious weeds are used at all of the surface coal mines in the Wyoming PRB as a result of the WDEQ/LQD regulatory requirements.

Mitigation to control invasion by noxious weeds for CBNG developers is determined on a site-specific basis and may include spraying herbicides before entering areas and washing vehicles before leaving infested areas. BLM reviews weed educational material during preconstruction on-site meetings with CBNG operators, subcontractors, and landowners. BLM also attaches this educational information to approved APDs or PODs (BLM 2003b). BLM also participates in a collaborative effort with the South Goshen Cooperative Extension Conservation District, the Natural Resources Conservation Service, private surface owners, WGFD, and the Weed and Pest District in a prevention program that includes a long-term integrated weed management plan, public awareness and prevention programs, and a common inventory (BLM 2003b).

4.2.7.4 Wetland and Riparian Species

Operations associated with development activities in the study area would result in the use of groundwater. Annually, during 2010-2020, from 30,000-35,000 mmgpy of CBNG-produced water would be discharged to impoundments or intermittent and ephemeral streams or reinjected. The discharge of produced water could result in the creation of wetlands in containment ponds, landscape depressions, and riparian areas along segments of drainages that previously supported upland vegetation. In addition, existing wetlands and riparian areas that would receive additional water would become more extensive and potentially support a greater diversity of wetland species in the long term. Alternately, the discharge of abnormally high flows or water with SARs of 13 or more could impact existing vegetation as discussed in the Task 1D Report for the PRB Coal Review (BLM 2005c). For agricultural uses, the current Wyoming water quality standard for SAR is 8.0 (WDEQ/WQD 2005). SARs of 5 to 10 have been observed in discharge waters in the study area (BLM 2003b). Once water discharges have peaked and subsequently decrease in the long term, the extent of wetlands and riparian areas and species diversity would decrease accordingly. After the complete cessation of water discharges, artificially-created wetland and riparian areas once again would support upland species and previously existing wetland and riparian areas would decrease in areal extent.

4.2.8 Wildlife and Fisheries

The PRB Coal Review Task 3D Report (BLM 2005f) discusses potential cumulative impacts to wildlife as a result of projected development activities in the PRB Coal Review Task 3 study area. The baseline year (2003) area of habitat disturbance and reclamation and the projected cumulative areas of habitat disturbance and reclamation for 2010, 2015, and 2020 related to surface coal mining are shown in Tables 4-2 and 4-3. The baseline year area of total habitat disturbance and reclamation and the projected cumulative total areas of habitat disturbance and reclamation for 2010, 2015, and 2020 are shown in Table 4-9.

Impacts to wildlife can be classified as short-term and long-term. Potential short-term impacts arise from habitat disturbance associated with a project's development and operation (e.g., coal mines, CBNG wells, etc.) and would cease upon project completion and successful reclamation in a given area. Potential long-term impacts consist of permanent changes to habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success, and habitat disturbance related to longer term projects (e.g., power plant facilities, rail lines, etc.). Direct impacts to wildlife populations as a result of development activities in the study area could include direct mortalities, habitat loss or alteration, habitat fragmentation, or animal displacement. Indirect impacts could include increased noise, additional human presence, and the potential for increased vehicle-related mortalities.

Habitat fragmentation from activities such as roads, well pads, mines, pipelines, and electrical power lines also can result in the direct loss of potential wildlife habitat. Other habitat fragmentation effects such as increased noise, elevated human presence, dispersal of noxious and invasive weed species, and dust deposition from unpaved road traffic can extend beyond the surface disturbance boundaries. These effects result in overall changes in habitat quality, habitat loss, increased animal displacement, reductions in local wildlife populations, and changes in species composition. However, the severity of these effects on terrestrial wildlife would depend on factors such as sensitivity of the species, seasonal use, type and timing of project activities, and physical parameters (e.g., topography, cover, forage, and climate).

4.2.8.1 Game Species

Big game species that are present within the Task 3 study area include pronghorn, white-tailed deer, mule deer, and elk. Potential direct impacts to these species would include the incremental loss or alteration of potential forage and ground cover associated with development construction and operational activities. Development associated with coal mining, drilling for CBNG, ancillary facilities, agricultural operations, urban areas, and transportation and utility corridors result in vegetation removal. Assuming that adjacent habitats would be at or near carrying capacity and considering the variabilities associated with drought conditions and human activities in the study area, displacement of wildlife species (e.g., big game) as a result of development activities would create some unquantifiable reduction in wildlife populations.

A number of big game habitat ranges occur within the PRB Coal Review Task 3 study area. In Wyoming, the WGFD and the BLM have established habitat categories based on seasonal use. Category types include crucial winter, severe winter, winter yearlong, and yearlong. Crucial winter range areas are considered essential in determining a game population's ability to maintain itself at a certain level over the long term. As discussed in the PRB Coal Review Task 2 report, discrete locations for most of the disturbance related to the projected development could not be determined based on the available information. However, identified future coal reserves were used for the Task 3 report to provide some level of quantification of potential future impacts to big game ranges. Tables 4-19 through 4-22 summarize the effects on pronghorn, deer, and elk game ranges as a result of the predicted lower and upper levels of coal production through 2020.

Direct and indirect effects to small game species (i.e., upland game birds, waterfowl, small game mammals) within the Task 3 study area as a result of development activities would be the same as

Table 4-19. Potential Cumulative Disturbance to Pronghorn Ranges from Development Activities--Lower and Upper Coal Production Scenarios (acres/percent affected).

	Pronghorn Ranges[1]			
Time Period/Scenario	**Crucial Winter**	**Severe Winter**	**Winter Yearlong**	**Yearlong**
2010/Lower	N/A	1,472 / 3%	33,196 / 2%	32,099 / 1%
2010/Upper	N/A	1,472 / 3%	34,760 / 2%	33,172 / 1%
2015/Lower	N/A	1,460 / 3%	32,649 / 2%	34,828 / 1%
2015/Upper	N/A	1,460 / 3%	34,177 / 2%	36,999 / 1%
2020/Lower	N/A	1,422 / 3%	33,637 / 2%	35,714 / 1%
2020/Upper	N/A	1,422 / 3%	33,580 / 2%	37,437 / 2%

[1] Potential coal mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the PRB Coal Review Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower production scenario) and existing (2003) disturbance from coal mine development.

Source: PRB Coal Review Task 3D Report (BLM 2005f)

Table 4-20. Potential Cumulative Disturbance to White-tailed Deer Ranges from Development Activities--Lower and Upper Coal Production Scenarios (acres/percent affected).

	White-tailed Deer Ranges[1]			
Time Period/Scenario	**Crucial Winter**	**Severe Winter**	**Winter Yearlong**	**Yearlong**
2010/Lower	N/A	N/A	N/A	1,411 / 0.6%
2010/Upper	N/A	N/A	N/A	1,411 / 0.6%
2015/Lower	N/A	N/A	N/A	1,497 / 0.7%
2015/Upper	N/A	N/A	N/A	1,495 / 0.7%
2020/Lower	N/A	N/A	N/A	1,704 / 0.7%
2020/Upper	N/A	N/A	N/A	1,707 / 0.8%

[1] Potential coal mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the PRB Coal Review Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower production scenario) and existing (2003) disturbance from coal mine development.

Source: PRB Coal Review Task 3D Report (BLM 2005f)

Table 4-21. Potential Cumulative Disturbance to Mule Deer Ranges from Development Activities--Lower and Upper Coal Production Scenarios (acres/percent affected).

	Mule Deer Ranges[1]			
Time Period/Scenario	**Crucial Winter**	**Severe Winter**	**Winter Yearlong**	**Yearlong**
2010/Lower	N/A	N/A	6,808 / 0.4%	25,390 / 1%
2010/Upper	N/A	N/A	6,924 / 0.4%	26,641 / 1%
2015/Lower	N/A	N/A	6,956 / 0.4%	26,420 / 1%
2015/Upper	N/A	N/A	7,285 / 0.5%	27,205 / 1%
2020/Lower	N/A	N/A	6,958 / 0.4%	27,004 / 1%
2020/Upper	N/A	N/A	7,413 / 0.5%	27,990 / 1%

[1] Potential coal mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the PRB Coal Review Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower production scenario) and existing (2003) disturbance from coal mine development.

Source: PRB Coal Review Task 3D Report (BLM 2005f)

Table 4-22. Potential Cumulative Disturbance to Elk Ranges from Development Activities--Low and High Development Scenarios (acres/percent affected).

Time Period/Scenario	Elk Ranges[1]			
	Crucial Winter	**Severe Winter**	**Winter Yearlong**	**Yearlong**
2010/Lower	24 / 0.4%	N/A	375 / 1%	1,444 / 0.9%
2010/Upper	24 / 0.4%	N/A	375 / 1%	1,444 / 0.9%
2015/Lower	24 / 0.4%	N/A	351 / 1%	1,161 / 0.7%
2015/Upper	24 / 0.4%	N/A	351 / 1%	1,162 / 0.7%
2020/Lower	24 / 0.4%	N/A	351 / 1%	1,121 / 0.7%
2020/Upper	24 / 0.4%	N/A	351 / 1%	1,168 / 0.7%

[1] Potential coal mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the PRB Coal Review Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower production scenario) and existing (2003) disturbance from coal mine development.

Source: PRB Coal Review Task 3D (BLM 2005f)

discussed above for big game species. Impacts would result from the incremental surface disturbance of potential wildlife habitat, increased noise levels and human presence, dispersal of noxious and invasive weed species, and dust effects from unpaved road traffic.

Operations associated with development activities in the Task 3 study area would result in the use of groundwater. Most, if not all, of the coal mine-produced water would be consumed during operation. It is projected that up to approximately 39,108, 41,899, and 37,390 mmgpy of water would be produced in 2010, 2015, and 2020, respectively. The portion of that water that is for area wildlife (e.g., waterfowl). Although much of the water would evaporate or infiltrate into the ground, it is anticipated that substantial quantities of water would remain on the surface and would result in the expansion of wetlands, stock ponds, and reservoirs, potentially increasing waterfowl breeding and foraging habitats. The median sodium concentration of CBNG-produced water from the Fort Union Formation is 270 mg/L. If sodium concentrations are maintained below 17,000 mg/L in the evaporation ponds, the potential adverse effects to waterfowl would be minimal.

4.2.8.2 Nongame Species

Potential direct impacts to nongame species (e.g., small mammals, raptors, passerines, amphibians, and reptiles) would include the incremental loss or alteration of potential foraging and breeding habitats from construction and operation of activities (e.g., vegetation removal for coal mines and CBNG wells, ancillary facilities, and transportation and utility corridors). Impacts also could result in mortalities of less mobile species (e.g., small mammals, reptiles, amphibians, and invertebrates), nest or burrow abandonment, and loss of eggs or young as a result of crushing from vehicles and equipment. Indirect impacts would include increased noise levels and human presence, dispersal of noxious weeds, and dust effects from unpaved road traffic. Assuming that adjacent habitats would be at or near carrying capacity and considering the variabilities associated with drought conditions and human activities in the study area, displacement of wildlife species from the Task 3 study area would result in an unquantifiable reduction in wildlife populations.

A number of migratory bird species have been documented within the PRB. In the event that development activities were to occur during the breeding season (April 1 through July 31), these activities could result in the abandonment of a nest site or territory or the loss of eggs or young, resulting in the loss of productivity for the breeding season. Loss of an active nest site, incubating adults, eggs, or young would not comply with the intent of the Migratory Bird Treaty Act and potentially could affect populations of important migratory bird species that may occur in the PRB.

Breeding raptor species that occur within the Task 3 study area include bald eagle, golden eagle, red-tailed hawk, Swainson's hawk, rough-legged hawk, American kestrel, prairie falcon, northern harrier, short-eared owl, and great horned owl. Potential direct impacts to raptors would result from the surface disturbance of nesting and foraging habitat in the PRB Coal Review Task 3 study area. In the event that development activities were to occur during the breeding season (February 1 through July 31), these activities could result in the abandonment of a nest site or territory or the loss of eggs or young, resulting in the loss of productivity for the breeding season. As discussed above, loss of an active nest site, incubating adults, eggs, or young would not comply with the intent of several laws, including the Migratory Bird Treaty Act and the Golden Eagle Protection Act.

New power line segments in the study area incrementally would increase the collision potential for migrating and foraging bird species (e.g., raptors and waterfowl) (APLIC 1994). However, collision potential typically is dependent on variables such as the location in relation to high-use areas (e.g., nesting, foraging, and roosting), line orientation to flight patterns and movement corridors, species composition, visibility, and design. In addition, new power lines could pose an electrocution hazard for raptor species attempting to perch on the structure. Configurations less than 1 kV or greater than 69 kV typically do not present an electrocution potential, based on conductor placement and orientation (APLIC 1996). It is assumed that future permitting for power lines would require the use of appropriate raptor-deterring designs, thereby minimizing potential impacts. For example, SMCRA requires that surface coal mine operators use the best technology currently available to ensure that electric power lines are designed and constructed to minimize electrocution hazards to raptors. In addition, many of the power lines for CBNG development currently are being constructed underground.

4.2.8.3 Fisheries

Potential cumulative effects on fisheries as a result of development activities in the Task 3 study area would be closely related to impacts on ground and surface water resources. In general, development activities could affect fish species in the following ways: 1) alteration or loss of habitat as a result of surface disturbance; 2) changes in water quality as a result of surface disturbance or introduction of contaminants into drainages; and 3) changes in available habitat as a result of water withdrawals or discharge. The potential effects of development activities on aquatic communities are discussed below for each of these impact topics.

The predominant type of aquatic habitat in the study area consists of intermittent and ephemeral streams and scattered ponds and reservoirs. In general, perennial stream habitat in the study area is limited to the Little Powder River. Warm water game fish and nongame species are present in the perennial stream segments and numerous scattered reservoirs and ponds. Due to a lack of water on a consistent basis in most of the potentially affected streams, existing aquatic communities are mainly limited to invertebrates and algae that can persist in these types of habitats. The removal of stock ponds would eliminate habitat for invertebrates and possibly fish species. This loss would be temporary if the stock ponds are replaced during reclamation.

Development activities could result in the loss of aquatic habitat as a result of direct surface disturbance. Table 4-9 summarizes the cumulative current (in 2003) and projected (in 2010, 2015, and 2020) acres of surface disturbance and reclamation. Discrete locations for development disturbance and reclamation areas cannot be determined based on existing information. However, projected development that could result in the loss of aquatic habitat would involve the construction of additional linear facilities, product gathering lines and road systems associated with conventional oil and gas and CBNG activities and any additional disturbance that would be associated with extending coal mining operations onto lands adjacent to the existing mines.

Projected activities would result in surface disturbance in each of the six Task 3 study area subwatersheds. Information relative to the stream crossing locations for the majority of the linear facilities is not available at this time. The proposed Bison Pipeline project is not currently active. If the project is constructed, it would cross Cottonwood Creek, a tributary of the Little Powder River. Typically, the associated disturbance would consist of a 100-foot-wide construction ROW; however, site-specific stream crossing methods and reclamation would be determined at the time of project permitting. Future coal mining also could remove intermittent or ephemeral streams and stock ponds in the Little Powder River, Upper Belle Fourche River, Upper Cheyenne River, and Antelope Creek subwatersheds. Coal mine permits provide for removal of first- through fourth-order drainages. During reclamation, third- and fourth-order drainages must be restored; first- and second-order drainages often are not replaced (Martin et al. 1988). As discussed in Section 3.5.2, the Belle Fourche River and its tributaries drain the existing Cordero Rojo Mine permit area and the Maysdorf LBA Tract. All streams, including the Belle Fourche River, within and adjacent to the tract are typical for the region, in that flow events are ephemeral. Under natural conditions, aquatic habitat is limited by the ephemeral nature of surface waters in the general analysis area. The results of fish surveys conducted in the Belle Fourche River during baseline studies for the Cordero Rojo Mine in 1975 and on the Maysdorf LBA Tract in 2005 are discussed in Section 3.10.7.1.

The PRB Coal Review assumes that surface disturbance activities would not be allowed in perennial stream segments or reservoirs on public land that contain game fish species. It also assumes that other types of development activities would not occur within stream channels nor remove ponds or reservoirs as part of construction or operation and, therefore, would not result in the direct loss of fish habitat.

Surface disturbing activities can result in sediment input to water bodies, which affects water quality parameters such as turbidity and bottom substrate composition. Contaminants also can be introduced into water bodies through chemical characteristics of the sediment. Potential related effects on aquatic biota could include physiological stress, movement to avoid the affected area, or alteration of spawning or rearing areas (Waters 1995). Studies have shown that TDS levels in streams near reclaimed coal mine areas have increased from one percent to seven percent (Martin et al. 1988). Typically, sedimentation effects are short-term in duration and localized in terms of the affected area. TSS concentrations would stabilize and return to typical background concentrations after construction or development activities have been completed. It is anticipated that sediment input associated with development disturbance areas would be minimized by implementation of appropriate erosion control measures, as would be determined during future permitting.

The removal of streamside vegetation and the resultant reduction in shade and potential for increased bank erosion also could degrade aquatic habitats. It is assumed these types of impacts would be limited to intermittent and ephemeral streams, since a buffer protection zone typically is required for development activities near perennial streams. ROW clearing for linear projects could remove riparian vegetation at stream crossings. However, effects on aquatic habitat would be limited to a relatively small portion of the stream (up to 100 ft in width depending on the type of development). It is anticipated that reclamation procedures to restore riparian vegetation would be required during future project permitting, thereby minimizing impacts.

CBNG and coal mining are the primary types of development activities that use or manage water as part of their operations. Based on current trends, it is assumed that most, if not all, of the coal mine-produced water would be consumed during operation. As discussed in Section 3.5.2.2, changes in surface runoff characteristics and sediment discharges would occur during surface coal mining as a result of the destruction and reconstruction of drainage channels as mining progresses and the use of sediment control structures to manage discharges of surface water from the mine permit area. State and federal regulations require treatment of surface runoff from mined lands to meet effluent standards. Coal mining-related surface water would be discharged into intermittent and ephemeral streams in four subwatersheds (Antelope Creek, Little Powder River, Upper Belle Fourche River, and Upper Cheyenne River). It is assumed that future permitting would allow a portion of CBNG-produced water to be discharged to intermittent and ephemeral drainages as is currently allowed in the six subwatersheds in the study area. It is projected that up to approximately 39,108, 41,899, and 37,390 mmgpy of water would be produced in 2010, 2015, and 2020, respectively. The portion of that water that is produced in association with CBNG production would be discharged to impoundments or intermittent and ephemeral streams. Based on past monitoring in receiving streams, no change in surface flows would be expected beyond approximately two miles from the discharge points (BLM 2003b). Water discharged from CBNG wells has supplied the Belle Fourche River and some tributaries, ponds, and playas with water nearly continuously for several years, but this reach of the Belle Fourche River has not become perennial, even with the addition of CBNG discharge water.

4.2.8.4 Special Status Species

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species (species that are protected under the ESA), BLM Sensitive Species, USDA-FS Sensitive Species, and WGFD Species of Special Concern in Wyoming. Further discussions of species that are protected under the ESA and BLM Sensitive Species are included in Appendices E and F of this Final EIS. The USFWS also has a list of Migratory Bird Species of Management Concern in Wyoming, which is discussed in Section 3.10.6 and in the Supplementary Information Document for this EIS. Special status species potentially occurring in the Task 1 study area are identified in Section 2.4.3.5 of the PRB Coal Review Task 1D Report (BLM 2005c).

Potential impacts to special status terrestrial species would be similar to those discussed above for nongame wildlife (e.g., small mammals, birds, amphibians, and reptiles). Potential direct impacts would include the incremental loss or alteration of potential habitat (native vegetation and previously disturbed vegetation) from construction and operation of development activities (e.g., vegetation removal for coal mines and CBNG wells, ancillary facilities, and transportation and utility corridors). Impacts also could result in mortalities of less mobile species (e.g., small mammals, reptiles, and amphibians), nest or burrow abandonment, and loss of eggs or young as a result of crushing from vehicles and equipment. Indirect impacts would include increased noise levels and human presence, dispersal of noxious weeds, and dust effects from unpaved road traffic.

In general, direct and indirect impacts to special status species would result in a reduction in habitat suitability and overall carrying capacity in the study area. Development within potential habitat for special status species likely would decrease its overall suitability and potentially would reduce or preclude use of a species habitat due to increased activity and noise. Future use of habitat by a special status species would be strongly influenced by habitat quality, the degree of impact would depend on a number of variables including the location of the nest or den site, the species' relative sensitivity, breeding phenology, and possible topographic shielding.

Bird species that have been identified as occurring within the PRB and are on two or more of the special status species lists include common loon, American bittern, white-faced ibis, trumpeter swan, greater sandhill crane, mountain plover, upland sandpiper, long-billed curlew, black tern, yellow-billed cuckoo, Lewis' woodpecker, pygmy nuthatch, sage thrasher, loggerhead shrike, Baird's sparrow, sage sparrow, Brewers sparrow, and greater sage-grouse. Any development activities (oil and gas and related development, coal mining and related development, or other development) that occur during the breeding season (April 1 through July 31) could result in the abandonment of a nest site or territory or the loss of eggs or young, resulting in the loss of productivity for the breeding season. As discussed previously, loss of an active nest site, incubating adults, eggs, or young as a result of any of these development activities would not comply with the intent of the Migratory Bird Treaty Act and potentially could affect populations of important migratory bird species that may occur in the PRB.

A number of raptor species have been documented in the PRB and are on two of more of the special status species lists including bald eagle, ferruginous hawk, northern goshawk, merlin, peregrine falcon, western burrowing owl, and short-eared owl. Potential direct impacts to raptors would result from the surface disturbance of breeding and foraging habitat. Breeding raptors in or adjacent to development activities could abandon breeding territories, nest sites, or lose eggs or young. As discussed previously, loss of an active nest site, incubating adults, eggs, or young would not comply with the intent of several laws, including the ESA, in the case of the bald eagle, and the Migratory Bird Treaty Act, and potentially could affect populations of important migratory bird species that may occur within the study area. New power line segments in the study area incrementally would increase the collision potential for migrating and foraging bird species such as raptors.

A total of 239 greater sage-grouse strutting ground (lek) sites were identified in the six subwatersheds in the PRB Coal Review Task 3 study area as of 2003; however, the PRB Coal Review did not evaluate the status of these leks (i.e., active or inactive). Sage-grouse are susceptible to infection with West Nile virus, and the incidence of infection is much higher in northeastern Wyoming than the rest of the state. As discussed in Section 3.10.5 and in the PRB Coal Review Task 1D report, the trend in the sage-grouse population for the Sheridan Region suggests about a 10-year cycle with periodic highs and lows. Subsequent population peaks appear lower than the previous peak, suggesting a steadily declining sage-grouse population within the Sheridan Region (Oedekoven 2001). Direct and indirect effects to greater sage-grouse within the study area as a result of development activities would be the similar to the impacts discussed above for big game species. Impacts would result from the incremental surface disturbance of potential habitat, increased noise levels and human presence, dispersal of noxious and invasive weed species, and dust effects from unpaved road traffic.

As discussed above for game species, based on existing information, the spatial relationship between projected future disturbance and reclamation areas for the projected coal development scenarios and the resource-specific information in the GIS layers could not be determined for the PRB Coal Review. However, the analysis did use GIS layers for future coal reserves to provide some quantification of potential future coal mining-related impacts. The results of this analysis are summarized in Table 4-23. The difference in the number of lek sites that would occur within two miles of coal mining activities under the lower production scenario verses the upper production scenario is due to slight variations in the projected disturbance areas. An unquantifiable number of the lek sites initially could be impacted by CBNG activity, which would occur in advance of coal mine development. Potential direct impacts to sage-grouse, if present, could include loss of foraging areas, abandonment of a lek site, or loss of eggs or young as a result of development activities.

Seven special status fish species potentially occur in the PRB Coal Review Task 3 study area subwatersheds: flathead chub (Little Powder River, Antelope Creek, and Upper Cheyenne River subwatersheds), plains topminnow (Upper Cheyenne River subwatershed), goldeye (Little Powder River subwatershed), lake chub (Little Powder River subwatershed), mountain sucker (Little Powder River subwatershed), silvery minnow (Little Powder River subwatershed), and plains minnow (Little Powder River, Upper Cheyenne River, and Upper Belle Fourche River subwatersheds). Potential impacts to special status fish species as a result of development activities would be similar to effects discussed above for fisheries. Surface disturbance in three subwatersheds (Little Powder River, Upper Belle Fourche River, and Upper Cheyenne River) could alter habitat or affect water quality conditions for special status fish species. Erosion control measures, as required by 2003 (PRB Coal Review baseline year) and future permits, and NPDES permit requirements would be implemented

Table 4-23. Potential Cumulative Impacts to Greater Sage-Grouse Leks from Coal Mine Development--Upper and Lower Coal Production Development Scenarios.

Lek Categories	2010/ Lower	2010/ Upper	2015/ Lower	2015/ Upper	2020/ Lower	2020/ Upper
Number of Directly Affected Leks	10	10	15	15	15	15
Number of Leks within Two Miles of Coal Mining Activity	47	47	47	49	50	49

Source: PRB Coal Review Task 3D Report (BLM 2005f)

for each project. These measures would help minimize increased sediment input to stream segments that may contain one of more of the special status fish species. Therefore, it is anticipated that impacts to special status fish species would be low.

4.2.9 Land Use and Recreation

The PRB Coal Review Task 3D report (BLM 2005f) discusses potential cumulative impacts to land use and recreation as a result of projected development activities in the PRB Coal Review Task 3 study area (Figure 4-4). The baseline year (2003) area of disturbance and reclamation and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 related to surface coal mining are shown in Tables 4-2 and 4-3. The baseline year area of total disturbance and reclamation and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Table 4-9.

The PRB is a predominantly rural, wide open landscape. With little rainfall and limited alternative sources of water, the primary land use is grazing. Nevertheless, there is a range of other land uses. The major categories include agriculture, forested, mixed rangeland, urban, water, wetlands, coal mines, and barren land. The relative amounts of these lands in the PRB Coal Review Task 1 and Task 2 study area (Figure 4-1) is tabulated in Table 4-24.

A large part of the PRB consists of split estate lands (privately owned surface lands underlain by federally owned minerals). This results in conflicts between surface users, which are mainly ranching interests, and mineral developers. There also may be conflicts with some dispersed rural residences, although specific locations cannot be identified until development is proposed.

Much of the study area is also used for dispersed recreational activities such as hunting. The study area includes surface lands that are federally, state, and privately owned. With nearly 80 percent of the area privately owned, public lands provide important open space and recreation resources including both developed recreation facilities and areas to pursue dispersed recreation activities. The private sector contributes the elements of commercial recreation opportunities and tourism services such as motels and restaurants. Some private land owners also allow hunting with specific permission, sometimes for a fee.

Table 4-24. Land Use by Surface Ownership.

Use Category	Surface Ownership				Total	
	BLM	**USDA-FS**	**State**	**Private**	**Acres**	**Percent**
Agriculture	2,627	14,197	13,770	472,811	503,405	6.3
Barren	165	205	187	9,396	9,953	0.1
Forested	137,555	14,604	48,645	332,062	532,866	6.7
Mixed Rangeland	732,014	218,156	561,363	5,271,644	6,783,177	86.0
Urban	893	17	1,039	25,469	27,418	0.3
Water	35	73	334	4,773	5,215	<0.1
Wetlands	0	104	559	1,566	2,229	<0.1
Coal Mines	149	7,236	2,805	40,917	51,107	0.6
Total	**873,438**	**254,592**	**628,702**	**6,158,638**	**7,915,370**	**100.0**

Source: PRB Coal Review Task 1D Report (BLM 2005c)

4.2.9.1 Grazing and Agriculture

Potential impacts to grazing in the Task 3 study area as a result of development activities can be classified as short-term and long term. Potential short-term impacts arise from:

- the temporary loss of forage as a result of vegetation removal/ disturbance;
- temporary loss of AUMs;
- temporary loss of water-related range improvements, such as improved springs, water pipelines, and stock ponds;
- temporary loss of other range improvements, such as fences and cattle guards; and
- restricted movement of livestock within an allotment due to the development and operation of projects like surface coal mines, which would cease after successful reclamation had been achieved and replacement of water-related and other range improvements had been completed.

The discharge of produced water could increase the availability of water to livestock, which may offset the temporary loss of water-related range improvements. Potential long-term impacts consist of permanent loss of forage and forage productivity in areas, such as power plants, that would not be reclaimed in the near term. Indirect impacts may include dispersal of noxious and invasive weed species within and beyond the surface disturbance boundaries, which decreases the amount of desirable forage available for livestock grazing in the long term.

Development activities could result in short- and long-term impacts to agricultural land, depending on their spatial relationship. Short-term impacts would include the loss of crop production during development and operational phases of the projects. Long-term impacts would result from the permanent loss of agricultural land due the development of permanent facilities such as power plants and railroads.

Table 4-25 contains an estimate of the number of AUMs unavailable on lands disturbed and not yet reclaimed through 2020 for the high and low levels of predicted development activity, along with the acreage of cropland estimated to be affected.

4.2.9.2 Urban Use

It is expected that there would be additional expansion of urban

Table 4-25. AUMs and Acres of Cropland Estimated Unavailable on Lands Disturbed and Not Yet Reclaimed as a Result of Development Activities.

Category	**2003/ Baseline**	**2010/ Lower**	**2010/ Upper**	**2015/ Lower**	**2015/ Upper**	**2020/ Lower**	**2020/ Upper**
Unavailable AUMs[1]	18,150	22,467	22,792	23,245	23,761	22,514	23,333
Unavailable Crop Land (acres)	48	59	60	134	139	206	289

[1] Based on an average stocking rate of six acres per AUM.

Source: PRB Coal Review Task 3D Report (BLM 2005f)

residential and commercial development as a result of the projected 48 percent growth in population (between 2003 and 2020) in Campbell County. Section 4.2.12 and the Task 3C Report of the PRB Coal Review (BLM 2005e) contain additional information on employment and population issues in the study area. A majority of the new urban development would be expected to occur adjacent to existing communities, primarily Gillette, which accounts for approximately 60 percent of the Campbell County population and, to a lesser extent, Wright and other small communities. Most of this development would occur on land that is currently in use for grazing or agriculture.

4.2.9.3 Recreation

Accessible public lands provide diverse opportunities for recreation, including hunting, fishing, ORV use, sightseeing, and wildlife observation. Public lands generally provide dispersed recreational uses in the study area. Some developed recreational facilities occur in special management areas, including recreation areas. While opportunities are available on BLM lands throughout the PRB, the majority of dispersed recreational uses occur in the western part of the PRB Coal Review Task 1 and Task 2 study area, including the South Big Horn Mountains area and along the Powder River. Public lands elsewhere consist mainly of isolated tracts of land that are too small to provide a quality recreational experience. Larger parcels of public lands occur in the southwest part of Johnson County and along the Powder River. Public lands are accessible via public roads or across private land with the landowner's permission.

Hunting is a major recreation use of state and federal lands in the study area. Various big game and upland game bird species are hunted in the region. Fishing is a popular year-round activity for residents of the study area.

Mule deer and pronghorn hunting are by far the most popular hunting activities in the Task 1 study area, accounting for 35,529 and 21,304 hunter days, respectively, in 2003 (Stratham 2005). The next highest were cottontail rabbit (2,348 hunter days) and elk (2,055 hunter days), followed by wild turkey (1,019), sharp-tailed grouse (508), and sage-grouse (38). Consistent trends in hunter activity over the past decade are not discernible from the WGFD data. All of the most prominent species hunted in the study area most prominent species hunted in the study area have had high years and low years. Pronghorn hunting, or example, was greatest from 1993 to 1996, while elk hunting was at its peak in 2001 and 2002. Mule deer hunting has been the most consistent, ranging from a low of 28,311 hunter days in 1996 to a high of 37,307 hunter days in 2002.

ORV use in the Task 1 study area is available on most BLM-managed lands. Most of the public land in Johnson, Sheridan, and Campbell Counties has been inventoried and designated as open, limited, or closed to ORV use. For the baseline year, approximately 20,386 acres were open to unlimited vehicle travel on and off roads. There were 4,680 acres in the area that were closed to all ORV use and approximately 867,534 acres were available for limited use. Limited use typically means ORVs are restricted to existing roads and vehicle routes.

Recreational use of public lands in the Task 1 study area has increased substantially over the past two decades, and is expected to continue to increase by about five percent every five years for most recreational activities (BLM 2003b). Total visitor use by residents and nonresident visitors in Campbell and Converse Counties in 1980 was projected at 1,276,000 visitor days (BLM 1979). The total visitor days of 1,881,763 estimated for 1990 was approximately 47 percent higher than the 1980 visitor days (BLM 2001c). Fewer than three percent of visitor days were estimated to occur on public lands.

Few, if any, of the developed recreation sites in the PRB Coal Review Task 3 study area would be affected by development related disturbance. As most of the projected disturbance area would occur on privately owned surface land, the extent of effects on dispersed recreation activities largely would depend on whether the disturbance areas had been open to public or private lease hunting. It is projected that cumulative development activities, especially the dispersed development of CBNG and, to a lesser extent, conventional oil and gas, would tend to exacerbate the trend toward a reduction in private land available for public hunting, which has been observed by WGFD in recent years (Shorma 2005). A reduction in available private land for dispersed recreation would contrast with the anticipated increase in demand for recreational opportunities and would tend to push more recreationists toward public lands where the BLM has projected a five percent increase in use every five years (BLM 2001a). After coal- and oil and gas-related development activities have been completed and the disturbed areas have been reclaimed, many of the adverse effects on dispersed recreation activities would be reduced.

It is expected that the development activities also would tend to expand and exacerbate the qualitative degradation of the dispersed recreation experience, in general, and of the hunting experience, in particular, as reported by the WGFD (Jahnke 2005). As noted in the Task 1D Report of the PRB Coal Review (BLM 2005c), a reduction in land available for hunting also makes herd management more difficult for the WGFD and reduces its hunting-derived revenues (Shorma 2005).

No direct effects on wilderness or roadless areas would be expected from the projected development activities. There are no designated wilderness areas in the study area, and mineral development would not be permitted in the Fortification Creek Wilderness Study Area until and unless Congress acts to remove it from Wilderness consideration.

There would be no effects on Wild and Scenic Rivers as the only river segment identified as both "eligible" and "suitable" in the Task 1D Report of the PRB Coal Review is not in the PRB Coal Review Task 3 study area.

4.2.10 Cultural Resources and Native American Concerns

The PRB Coal Review Task 3D report (BLM 2005f) discusses potential cumulative impacts to cultural resources as a result of projected development activities in the PRB Coal Review Task 3 study area. The baseline year (2003) area of disturbance and reclamation and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 related to surface coal mining are shown in Tables 4-2 and 4-3. The baseline year area of total disturbance and reclamation and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Table 4-9.

Cultural sites occur throughout the study area. Table 4-26 contains an estimate of the amount of projected disturbance through 2020 for the projected lower and upper levels of coal development activity, along with an estimate of the number of cultural sites that would potentially be affected. The sites fall into two categories; prehistoric sites and historic sites, as described below. A description of Native American traditional cultural places and a summary of the program to protect sites in any of these categories follow.

4.2.10.1 Prehistoric Sites

All recognized prehistoric cultural periods, from Clovis through Protohistoric (about 11,500 to 200 years ago), are represented in the PRB Coal Review study area. (See Section 3.12 for additional discussion about the prehistoric cultural periods.) The earliest prehistoric cultural periods, Paleoindian through Early Plains Archaic, are represented by only a small number of sites. Archaic and later prehistoric period sites (Archaic to Protohistoric) are represented in increasing numbers as a result of higher populations through time and better preservation of more recent sites. Important prehistoric site types in the region include artifact scatters, stone circles, faunal kill and processing sites, rock alignments and cairns, and stone material procurement areas.

Artifact scatters dominate prehistoric sites in the study area. When there is adequate information to evaluate these types of sites, most are not eligible to the NRHP. However, complex sites and sites with buried and dateable material are often field evaluated as eligible. The proportion of unevaluated sites is lower in subwatersheds in which more

Table 4-26. Square Miles of Projected Cumulative Disturbance and Number of Potentially Affected Cultural Resource Sites in the PRB Coal Review Task 3 Study Area – Lower and Upper Coal Production Scenarios.

Sub-watershed	Average Number of Sites per Square Mile[1]	Lower Coal Production Scenario						Upper Coal Production Scenario					
		Year 2010		Year 2015		Year 2020		Year 2010		Year 2015		Year 2020	
		Square Miles[2]	Sites[3]	Square Miles[2]	Sites[3]	Square Miles[2]	Sites[3]	Square Miles[2]	Sites[3]	Square Miles[2]	Sites[3]	Square Miles[2]	Sites[3]
Antelope Creek	4.7	74	346	97	484	122	608	75	376	99	496	126	629
Dry Fork Cheyenne River	8.9	8.3	74	12	109	17	151	8.3	74	12	109	17	151
Little Powder River	4.6	90	415	108	495	123	567	91	419	109	502	125	577
Upper Belle Fourche River	4.3	164	704	186	801	209	899	166	713	192	824	219	940
Upper Cheyenne River	5.2	60	314	72	375	83	433	62	321	74	387	85	445
Upper Powder River	5.0	135	674	190	953	232	1,159	135	674	191	953	232	1,159
Total		**531**	**2,527**	**665**	**3,217**	**786**	**3,817**	**537**	**2,577**	**677**	**3,271**	**804**	**3,901**

[1] Average number of sites per square mile based on previous surveys in the study area.

[2] Calculated, based on database disturbance acreages prepared for the Task 2 Report for the PRB Coal Review, Past and Present and Reasonably Foreseeable Development Activities (Appendices A and D) (BLM 2005d).

[3] The number of sites was calculated by multiplying the average density of known cultural sites per square mile (based on previous surveys) by the number of square miles of projected cumulative disturbance.

Source: Task 3D Report for the Powder River Basin Coal Review Cumulative Environmental Effects (BLM 2005f) studies and more follow-up studies have been conducted, such as Antelope Creek, Upper Cheyenne River, and Upper Belle Fourche River. Some portions of some of the subwatersheds which have more varied habitats or conditions more conducive to preservation are very rich in significant prehistoric sites. Within the PRB Coal Review Task 3 study area, these areas include the lower Antelope Creek drainage and eastern portions of the Upper Belle Fourche River. More detailed information on the known cultural sites that are present in the PRB based on the existing surveys is included in the Task 1D Report for the PRB Coal Review (BLM 2005c).

4.2.10.2 Historic Sites

Historic site categories documented for the study area are based on broad historic themes. The site categories are Rural, Urban, Mining, Transportation, Military, Exploration, and Communication. Each of these site categories and the types of sites they include are detailed in the Task 1D Report for the PRB Coal Review (BLM 2005c). Evaluation of the importance of historic sites, districts, and landscapes must consider aspects of both theme and period in assessing the historic character and contributing attributes of the resources.

4.2.10.3 Native American Traditional Cultural Places

General ethnographies of the tribes that may have had traditional ties to this region do not provide information on specific resources in the study area that are likely to be traditional cultural concerns because these resources are considered confidential by the tribes. Within this region, there are prominent and identifiable places such as the Medicine Wheel to the west in the Big Horn Mountains and Devils Tower to the east in the Black Hills area. These known sites offer some indication of the types of places valued by the Plains horse cultures in the historic period. Any identification of sacred or traditional localities must be verified in consultation with authorized tribal representatives.

4.2.10.4 Site Protection

At the time an individual project is permitted, the development activities considered in this study would be subject to the following regulations relative to cultural resources. Section 106 of the National Historic Preservation Act of 1966 as amended, its implementing regulations, including but not limited to 36 CFR 800, 36 CFR 61, Executive Order 11593, and NEPA and its implementing regulations, including 40 CFR 1500 - 1508, provide the legal environment for documentation, evaluation, and protection of historic properties (i.e., cultural resources eligible for inclusion on the NRHP) that may be affected by development activities. In cases of split estate (where surface ownership and mineral ownership differ), surface resources, such as cultural sites, belong to the surface owner. The surface owner must be consulted about investigation, mitigation, or monitoring.

4.2.11 Transportation and Utilities

The PRB Coal Review Task 3D report (BLM 2005f) discusses potential cumulative impacts to transportation and utilities systems as a result of projected development activities in the PRB Coal Review Task 3 study area. The baseline year (2003) area of disturbance and reclamation and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 related to surface coal mining are shown in Tables 4-2 and 4-3. The baseline year area of total disturbance and reclamation and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Table 4-9.

Generally, transportation systems in the study area would not be directly affected by the disturbance associated with projected development. Site-specific instances of disturbance may require that segments of highways, pipelines, transmission lines, or railroads be moved to accommodate expansion of certain coal mines. In such cases, the agencies authorized to regulate such actions would have to approve any proposal to move any segments of any transportation systems and construction of alternative routing would be required prior to closing existing links so that any disruptive effects on transportation systems would be minimized.

The coal mines in the North Gillette subregion currently ship most of their coal via the east-west BNSF rail line through Gillette. That subregion produced 55 mmtpy in the baseline year (2003), which was just 22 percent of the estimated 250 mmtpy capacity of the BNSF rail line (BLM 2005f). The coal mines in the South Gillette and Wright subregions produced approximately 308 mmtpy in 2003, which was 88 percent of the estimated 350 mmtpy capacity of the joint BNSF & UP line serving those areas in the baseline year.

Potential effects of development activities on transportation and utilities may be either short- or long-term in nature, varying with the type of development. A power plant or an urban community development would be considered long-term, and the demand for transmission line capacity would be virtually permanent, lasting for the economic life of the activity. The effects of coal production and the related demand for rail capacity would vary with market changes. In recent years, coal production has been increasing and the PRB Coal Review projects that the trend would continue, as shown in Tables 4-2 and 4-3. Similarly, the demand for pipeline capacity would vary with market conditions as well as with the rate of depletion of the oil or gas resource.

Potential direct effects of projected development on roads and highways would include increased vehicular traffic and risk of traffic accidents on existing roadways in the PRB Coal Review Task 3 study area from daily travel by workers and their families. Indirect effects would include increased wear and tear on existing roads, additional air emissions from vehicles, additional fugitive dust from roads, noise, increased potential access to remote areas, and an increased risk of vehicle collisions with livestock and wildlife. Direct effects on railroads, pipelines, and transmission lines primarily would include increased demand for capacity to move coal, oil and gas, and electricity from production locations in the study area to markets outside the area.

The socioeconomic analysis conducted as a part of Task 3C of the PRB Coal Review projects a population increase of approximately 48 percent between 2003 and 2020 in Campbell County under the upper coal production scenario (BLM 2005e). Campbell County accounts for most of the population in the PRB Coal Review Task 3 study area. Based on traffic studies conducted independently of the PRB Coal Review, vehicle miles traveled tend to increase at or above the rate of population growth. Consequently, highway traffic would be expected to increase by at least 48 percent by 2020. Approximately 60 percent of the population growth would occur in or near Gillette, which would indicate that the same proportion of traffic would originate in the Gillette area. The remainder of the traffic growth would be dispersed throughout the study area. Under this scenario, the greatest impact on traffic would occur in the Gillette area, where existing traffic volume to capacity ratios are highest. The increased traffic would be expected to cause delays in the Gillette area and might require widening of some streets and roads or other measures to increase traffic capacity. It is anticipated that there would be an increase in the risk of traffic accidents approximately proportional to the increase in traffic. Highway capacity on major routes away from Gillette would be expected to be sufficient to accommodate the growth without substantial constraints.

Existing rail lines, together with upgrades currently under way on the joint BNSF & UP line would be expected to accommodate the projected coal transportation traffic through 2015 (Table 4-27). The PRB Coal Review Task 2 Report (BLM 2005d) projects that the proposed DM&E line would be built and operational by 2015 (pending completion of additional environmental analysis and availability of funding), adding 100 mmtpy in additional shipping capacity for the South Gillette and Wright subregions.

Current gas pipeline capacity out of the PRB is approximately 1.9 bcf per day; total conventional natural gas and CBNG production is slightly below 1.1 bcf per day. Based on the information in the Task 2 Report for the PRB Coal Review, basin-wide production of CBNG has been projected to double by 2020. This potential is pipeline-capacity limited, suggesting additional pipelines could be built. One potential additional pipeline (Bison Project) has been identified for completion by 2010. No other specific projects are under way.

An estimated 1,700 MW of new power production capacity is anticipated in the cumulative effects area by 2020. This level of production would require construction of additional transmission line capacity. It is assumed that new transmission lines would be constructed to connect new power plants to the grid. However, no specific projects

Table 4-27. PRB Rail Lines Coal Hauling Capacity and Projected Use.

Rail Line	2010 Capacity	2010 Projected Rail Use Increase[1]		2015 Capacity	2015 Projected Rail Use Increase[1]		2020 Capacity	2020 Projected Rail Use Increase[1]	
	mmtpy	mmtpy	%	mmtpy	mmtpy	%	mmtpy	mmtpy	%
North BNSF	250	62-78	25-31	250	74-104	30-42	250	78-121	31-48
South BNSF & UP	400	349-401	87-100	500	393-439[2]	79-88[2]	500	417-455[2]	83-91[2]
DM&E	0	0	0	-[2]	-[3]	-[3]	-[2]	-[3]	-[3]

[1] The range of increases in use shown for each year reflects the increases that are projected for the Lower and Upper Production Scenarios, respectively.

[2] The DM&E is assumed to be built and operational by 2015, adding 100 mmtpy of capacity for the mines served by the BNSF & UP South line.

[3] The BNSF & UP South figures represent the projected combined traffic and percent capacity on the BNSF & UP South line and the projected DM&E line.

Source: PRB Coal Review Task 3D Report (BLM 2005f)

have been identified so the location(s), capacities, and effects on the existing system cannot be determined at this time.

4.2.12 Socioeconomics

The socioeconomic impact analysis focuses on Campbell County, but also considers Converse, Crook, Johnson, Sheridan, and Weston Counties as directly affected and Niobrara and Natrona Counties as indirectly affected. Current and projected socioeconomic conditions are described in more detail in the Task 1C and 3C reports for the PRB Coal Review (BLM 2005b and 2005e).

REMI Policy Insight (REMI), a regional economic model, was used to develop the cumulative employment and population projections presented below. The version of the REMI model for this study was calibrated to represent two economic regions: the first consisting of Campbell County alone, and the second composed of the counties in Wyoming that border Campbell County and are linked to its economy by established industrial and consumer trade linkages and by work force commuting patterns. Results for the second region were then analyzed to focus on the five counties, Converse, Crook, Johnson, Sheridan, and Weston, that are the most directly linked. Collectively, these five counties are referred to in the PRB Coal Review Task 3C report (BLM 2005e) as the surrounding counties. Additional analysis was undertaken to "disaggregate" REMI's population and employment forecasts for each of the surrounding counties and to derive housing requirements and project future school enrollment.

During the 1970s and early 1980s, the PRB emerged as a major coal producing region. Federal coal leasing has been a high profile activity since over 90 percent of the coal resources in the PRB are federally owned. The surface coal mines that were developed during the 1970s and early 1980s are now mature operations, providing a stable economic and social foundation for the region. While energy development has produced periodic surges in population, followed occasionally by population loss in some communities, the growth in domestic energy consumption, coupled with the PRB's vast energy resource base, has resulted in a 50-year growth trend in the region without the absolute economic busts that have characterized some other western U.S. resource booms. This period of extended energy development has been accompanied by substantial benefits, including economic growth, employment opportunity, tax revenue growth, and infrastructure development for local governments in the region and across Wyoming as tax revenues generated by production of coal and other energy resources have funded infrastructure development programs statewide. At the same time, periods of rapid growth have stressed communities and their social structures, housing resources, and public infrastructure and service systems.

The emergence of the coal and other energy resource development industries in the PRB has had a long-term cumulative influence on social and economic conditions in the region. In general, Campbell County and the entire PRB region have developed a greater capacity to respond to and accommodate growth. The regional coal industry also provides a measure of insulation from dramatic economic and social dislocations. Key current cumulative social and economic conditions are described below.

4.2.12.1 Employment and the Economic Base

Energy resource development since 1970 has resulted in substantial economic expansion across the PRB. Total employment expanded by 156 percent as 38,948 net new jobs were added between 1970 and 2002. The most rapid expansion occurred between 1975 and 1980. After modest growth and slight decline in the 1980s and early 1990s, employment growth resumed in the late 1990s, led by increases in coal mine employment, including subcontractors, and CBNG development. Across the six-county area, total employment was 63,871 in 2002. Nearly half of the net job gain occurred in Campbell County, where total employment increased from 6,026 jobs in 1970 to 25,453 jobs in 2002. Strong gains also were posted in Sheridan County (9,052 jobs) and Converse County (4,323 jobs).

The economic stimuli associated with the gains in mining and CBNG employment and the long-term population growth triggered secondary job gains in construction, trade, services, and government. In 2002, business and consumer services accounted for 55.5 percent of all jobs in the region, while mining and government accounted for 10.7 percent and 14.5 percent of all jobs, respectively. Farm employment in the region, as a share of total employment, declined from 14.3 percent in 1970 to 5.0 percent in 2002. However, that shift is primarily due to growth in non-farm employment rather than declines in farming, as total farm employment in the PRB recorded a net decline of only 333 jobs, from 3,571 to 3,238.

The largest impetus to future growth over the PRB Coal Review study period (2003 to 2020) is expected to occur by 2010. Under the lower production scenario, employment in 2010 related to coal mining, oil and gas production, and oil field services is projected to increase by one-third, or more than 2,300 jobs, as compared to 2003 levels. A large portion of the jobs gained would be the result of increased oil and gas development. While the number of coal mining jobs would increase, the projected coal mine-related productivity gains would limit increases in the number of mine employees required for operations.

Beyond 2010, as major infrastructure development (e.g., additional CBNG compression capacity) is completed and the pace of conventional oil and gas drilling decreases, total employment related to coal mining, oil and gas production, and oil field services would decline. Increases in CBNG production and coal mining employment would occur thereafter, such that total mining employment would approach pre-2010 levels by the end of the forecast period (2020). Under the development scenarios, construction of the three new power plants, having a combined capacity of 1,000 MW, is assumed to occur concurrently with the increases in mining employment, with a peak work force of approximately 1,550 workers in 2007-2008. Under the upper production scenario, a second temporary construction work force impact would occur between 2016 and 2020 in conjunction with the construction of an additional 700-MW power plant.

The net effects of these activities, including secondary effects on suppliers, retail merchants, service firms, and state agencies and local government in the region, would be the creation of more than 8,700 new jobs in the region between 2003 and 2010. Of those, more than 5,600 jobs (a 22 percent increase over 2003 employment) would be based in Campbell County. The pace of economic expansion, at least in terms of jobs, would moderate after 2010. Total employment growth of 2,017 additional jobs is projected in Campbell County between 2010 and 2020, with 1,741 additional jobs projected in the surrounding counties.

Several important issues arise in the context of the rapid economic expansion implied by the growth projections through 2010. One issue is that achieving the projected levels of energy and mineral development activity assumes that industry has access to the necessary equipment, materials, labor, and other vital inputs. Current oil and gas exploration and development interest across the Rocky Mountain region has absorbed the available inventory of drilling rigs and crews. A lack of additional resources could delay or limit the job gains below the levels projected, even though prospects for such growth remain. Secondly, the competition for equipment could combine with tight labor markets to negate the productivity gains that underlie the projections, such that the employment and associated impacts do materialize, but are associated with lower levels of activity (e.g., a lengthier construction period for a power plant or fewer new wells drilled each year).

Employment effects associated with the upper coal production scenario, assuming productivity gains in coal mining equivalent to those in the lower production scenario, would result in total employment gains of 11,563 jobs by 2010 in the six-county study area, with an additional 3,667 jobs by 2020. (Projected coal mining employment under the upper production scenario was estimated assuming future productivity gains comparable to those under the lower production scenario. This assumption reflects a departure from the assumptions established for the upper production scenario in the Task 2 report, whereby a 16 percent higher production would be achieved with a 2.5 percent increase in workforce. Those assumptions, although based on a continuation of historic productivity gains, may underestimate population and employment growth and related socioeconomic effects if the production is achieved but the productivity gains lag. Using the productivity gains from the lower production scenario thus provides a more conservative perspective on potential long-term population growth for the purposes of the cumulative analysis). As compared to the employment projections under the lower coal production scenario, those gains would include 2,821 additional jobs in 2010 and 3,214 additional jobs in 2020. Most of the incremental gains would be based in Campbell County, further stressing labor markets, housing, and other community resources. Such pressures could delay or affect the development plans of individual firms and operators, such that the projected employment levels would not be realized in the time frames shown. Nonetheless, substantial growth in employment is expected to occur, and even if the projected total employment levels are not realized, substantial social and economic impacts still would be anticipated.

The economic stimuli associated with the projected development also would stimulate increases in employment in other nearby counties beyond the five surrounding counties identified above. However, the potential effects in these areas are not addressed in the PRB Coal Review Task 3C Report because most of the effects would comprise indirect or induced growth that would be limited in scale relative to the size of the respective economies. Furthermore, the economic outlook for those areas is influenced by factors that are beyond the scope of this study, such as the role of the oil and gas support services industry based in Natrona County in supporting energy development in the south-central and southwestern portions of Wyoming.

4.2.12.2 Labor Market Conditions

Labor market conditions in the PRB reflect a generally healthy economy, with average annual county unemployment rates between 3.2 percent and 4.8 percent in 2003. Johnson County recorded the lowest unemployment (3.2 percent) and Converse County registered the highest (4.8 percent). Statewide and national unemployment rates for the period were 4.4 percent and 6.0 percent, respectively.

Over time, local unemployment levels and rates have reflected the influences of the large, relatively stable employment baseline associated with the coal mining industry and the more transitory and variable influences of natural gas development and other industries. Prior to the beginning of CBNG development in 1989, unemployment in Campbell County fluctuated between 4.8 and 5.35 percent, slightly above the corresponding statewide averages. Labor demand associated with CBNG development contributed to a decline in unemployment to below 3.0 percent in 2001. As the pace of CBNG development has stabilized, labor demand eased and unemployment rates climbed to 5.2 percent in 2003, before abating.

The employment effects identified above from 2003-2020 imply substantial pressures on local labor markets. Strong demand for labor would lower local unemployment, creating upward pressure on wages and salaries. Those influences would stimulate substantial economic migration into Campbell County, causing impacts to population, housing demand, and other economic and social conditions. Similar influences would occur in the surrounding counties, although the implications are less severe because the scale of the effects would be smaller and would be distributed over multiple communities and service providers.

4.2.12.3 Personal Income

A benefit associated with energy resource development, whether it is mineral mining or oil and gas development, is wages and salaries that are among the highest in the state. Personal income registered strong gains across the region, but especially in Campbell County, during the late 1970s and early 1980s. In 1981, per capita personal income in Campbell County was $17,520, compared to the national average of $11,280 and the statewide average of $12,879. Personal income growth was tempered by several years of economic stagnation during the late 1980s. Renewed economic vitality since then resulted in per capita personal income in Campbell County reaching $30,253 in 2002. Those gains notwithstanding, per capita income among Campbell County's residents was below statewide and national norms, as well as that for Sheridan ($32,563) and Weston ($31,388) Counties. When measured on a median household or family income basis in the 2000 census, Campbell County led statewide, national, and other counties in the PRB by considerable margins.

In terms of total personal income, Campbell County leads the six-county region with $1.093 billion in 2002. Sheridan County residents recorded aggregate personal income of $878 million in 2002. Total personal income in the other counties was substantially lower, ranging from $177.8 million in Crook County to $347.8 million in Converse County.

Personal incomes in the region would increase over the time period 2003-2020, both in aggregate and on a per capita basis, in conjunction with the economic outlooks foreshadowed by the projected development scenarios. In 2003, total personal income was $1.12 billion in Campbell County and approximately $1.88 billion in the surrounding counties. Under the lower production scenario, total personal income would more than triple to $3.34 billion in 2020, and personal income in the surrounding counties would increase by approximately 136 percent to $4.43 billion (all in nominal dollars). The upper production scenario would generate an additional $266 million per year in Campbell County and an additional $35 to $40 million per year in the surrounding counties by 2020. Annual per capita incomes are projected to increase by approximately 27 percent (in real terms) across the region between 2003 and 2020. Households with one or more workers employed directly in the energy industry, associated key suppliers, and the construction industry likely would realize larger shares of the overall gains.

4.2.12.4 Population and Demographics

Population change over time is perhaps the single best indicator of cumulative social and economic change in the PRB. Campbell County was not among the original 13 counties when Wyoming was admitted to statehood, but it was carved from Weston and Crook Counties in 1911. Campbell County's population of 5,233 in the 1920 census ranked it seventeenth among Wyoming's counties. Forty years later and prior to the onset of coal development in the region, Campbell County, with a population of 5,861, ranked eighteenth among Wyoming's counties in terms of population, with neighboring Converse, Sheridan, and Weston Counties each having a larger population.

By 1980, Campbell County's population had increased by more than 300 percent, to 24,367, seventh among Wyoming's counties. Energy development also contributed to population growth in Sheridan, Converse, Johnson, and Crook Counties during that period. Weston County recorded a population decline during the period; however, the combined population of the PRB climbed from 49,311 in 1960 to 82,598 in 1980.

Annual coal production in the PRB has increased by nearly 500 percent since 1980, accompanied by expanded mine service and rail transportation capacity, stimulating further growth. The impetus for growth was tempered by substantial productivity increases in the mining industry, coupled with declining production of other energy resources. Consequently, the region's population gained a relatively modest 11 percent, 9,318 residents, between 1980 and 2000, reaching 91,916. Campbell County registered a net gain of 9,331 residents during that period, raising its total population to 33,698 in 2000, fourth highest in the state. Across the rest of the PRB, the loss of about 2,000 residents in Converse County was offset by modest gains in the other four counties (U.S. Census Bureau 2001).

More recently, the PRB has seen renewed population growth, primarily linked to CBNG development. Population estimates for 2003 indicate a total regional population of 96,078, a 4.4 percent increase over the 2000 census population. Gains were reported for all six counties, ranging from 29 persons in Weston County to 2,740 persons in Campbell County (Table 4-28). City officials estimate that Gillette's populations grew by almost 2,000 people (6.2 percent) in 2006 (Gillette News-Record 2007).

The magnitude and timing of projected employment changes from 2003-2020 under either production scenario would trigger corresponding effects to population across the PRB, particularly in Campbell County (Figure 4-6).

Under the lower production scenario, Campbell County's population is projected to increase by more than 14,550 residents between 2003 and 2020, of which nearly 9,500 additional residents are anticipated by 2010. Growth over the next five to six years would result in substantial pressures on housing and other community resources. The projected energy and mineral development in the lower production scenario would also result in substantial population growth elsewhere in the PRB, with Sheridan, Johnson, and Converse Counties all projected to gain substantial population. Population growth, like employment growth, would moderate after 2010.

Projected population growth between 2003 and 2020 ranges from 0.5 percent CAGR in Weston County to 2.0 percent CAGR in Campbell County. In absolute terms, the net change ranges from 537 additional residents in Weston County to a gain of 14,557 residents in Campbell County. The combined population of the six-county study area is projected to climb from 96,078 in 2003 to 120,178 in 2020, a 1.3 percent CAGR.

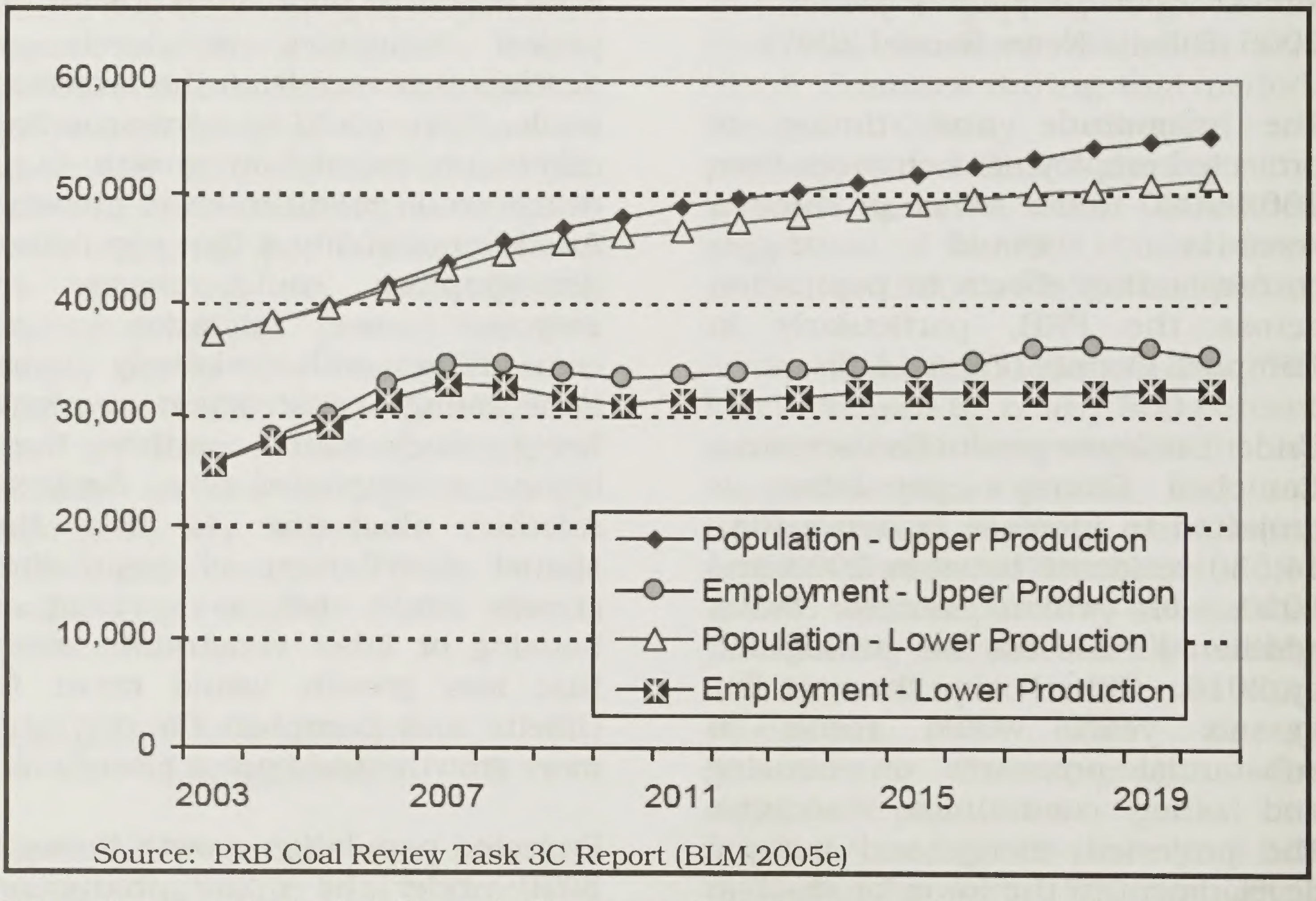
As with employment, changing development conditions could result in actual population growth varying from projected population growth. If project schedules or levels of development vary from the projected levels, there could be corresponding effects on population growth (e.g., delays could result in lower growth). Another possibility is that population demographics could change in response to migration and commuting, with relatively more immigrating construction workers being single-status, rather than being accompanied by families. Another alternative is that the spatial distribution of population growth could shift as a result of housing or labor constraints, such that less growth would occur in Gillette and Campbell County, and more growth would occur elsewhere.

Projected population growth through 2020 under the upper production scenario is approximately 19 percent higher than under the lower production scenario (28,625 compared to 24,100, with the six-county population reaching 124,703 by 2020). Much of the incremental population growth would occur by

Table 4-28. Recent and Projected PRB Population.

Year	Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Total Study Area
				Census			
2000	33,698	12,104	5,895	7,108	26,606	6,642	92,053
2003	36,438	12,314	5,986	7,554	27,115	6,671	96,078
				Lower Coal Production Scenario			
2010	45,925	13,103	6,542	8,389	28,459	7,108	109,526
2015	48,905	13,671	6,759	8,867	30,016	7,174	115,392
2020	50,995	14,193	6,989	9,326	31,467	7,208	120,178
				Upper Coal Production Scenario			
2010	47,662	13,160	6,570	8,424	28,579	7,137	111,532
2015	51,558	13,763	6,802	8,924	30,214	7,219	118,480
2020	54,943	14,313	7,045	9,403	31,733	7,266	124,703

Source: U.S. Census Bureau 2005 (2000 and 2003 data)



Source: PRB Coal Review Task 3C Report (BLM 2005e)

Figure 4-6. Projected Campbell County Population and Employment to 2020.

2010 in Campbell County, and in particular in and near Gillette.

Community population growth under the upper production scenario generally would mirror growth under the lower production scenario but with higher growth in Wright, Douglas, and Newcastle due to the effects of higher coal production, coal transportation, and power generation concentrated in the southern portion of Campbell County.

Demographic characteristics from the 2000 census reveal many similarities to the statewide population, but also many minor differences across the PRB as shown in Table 4-29.

4.2.12.5 Housing

While the population grew by 55 percent in the 1970s, the housing stock in the study area grew by almost 78 percent. Housing growth was especially rapid during the 1970s in Campbell County, where population grew by 88 percent and the housing stock grew by 140 percent. In 2000, the housing inventory in the six-county study area was 41,203 units (Table 4-30).

This expansion in housing supply, combined with the slowdown in the rate of population growth produced double-digit vacancy rates for rental housing in the late 1980s and early 1990s. At the same time, vacancy rates among ownership housing remained tight. After growth resumed in the mid-1990s, most county-level vacancy rates for ownership units were at or below the state levels in 2000. Vacancy rates for rental units declined even more sharply. By 2000, rental vacancy rates in Campbell County were below the state average and were well below the average in Johnson County and Sheridan County. Monthly costs for rental housing in the PRB, measured in the fourth quarter of 2003, generally were highest in Campbell County (Table 4-31).

In 2002, the average sale price of homes in the study area varied from $70,674 in Weston County to $142,565 in Sheridan County. The average home price statewide in 2002 was $120,314. In addition to Sheridan County, Campbell ($133,482) and Johnson ($131,782) Counties also had average home sale prices above the statewide average in 2002. A combined total of 1,242 new housing units were issued permits from 1998 through 2002 in the PRB, including permits for 400 housing units in Campbell County and 509 units in Sheridan County. Although not all local governments in the study area issue permits, these data are general indicators of residential construction activity.

Temporary housing resources are available in the PRB in the form of hotel-motel rooms, private and public campgrounds, two large special event facilities, and vacant spaces in mobile home parks. In all, there are an estimated 71 lodging establishments with a total of more than 2,500 rooms. These housing resources, supplemented by pockets of persistently vacant apartments, townhouses, and mobile home spaces in Gillette and Wright, have accommodated temporary housing needs associated with natural resource and energy projects in the past.

Both projected development scenarios suggest a strong demand for housing across the six-county study area in the period 2003-2020. Net new housing requirements under the lower production scenario would include approximately 11,270 units through 2020, a 26 percent increase above the total existing inventory in

Table 4-29. Demographic Characteristics.

Characteristic	Wyoming	Campbell County	Other PRB Counties
Median Age	36.2	32.2	37.5 – 43.0
Percent Residents < 18 Years Old	26.1	31.0	24.1 – 28.5
Average Household Size	2.48	2.73	2.31 – 2.55
Percent Minority Residents	7.9	3.9	3.0 - 5.3

Source: PRB Coal Review Task1C Report (BLM 2005b)

Table 4-30. Total Housing Stock in 2000.

Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Six-county PRB Region
13,288	5,669	2,935	3,503	12,577	3,231	41,203

Source: U.S. Census Bureau (2001)

Table 4-31. Monthly Housing Rents in 2003[1] in the PRB Study Area.

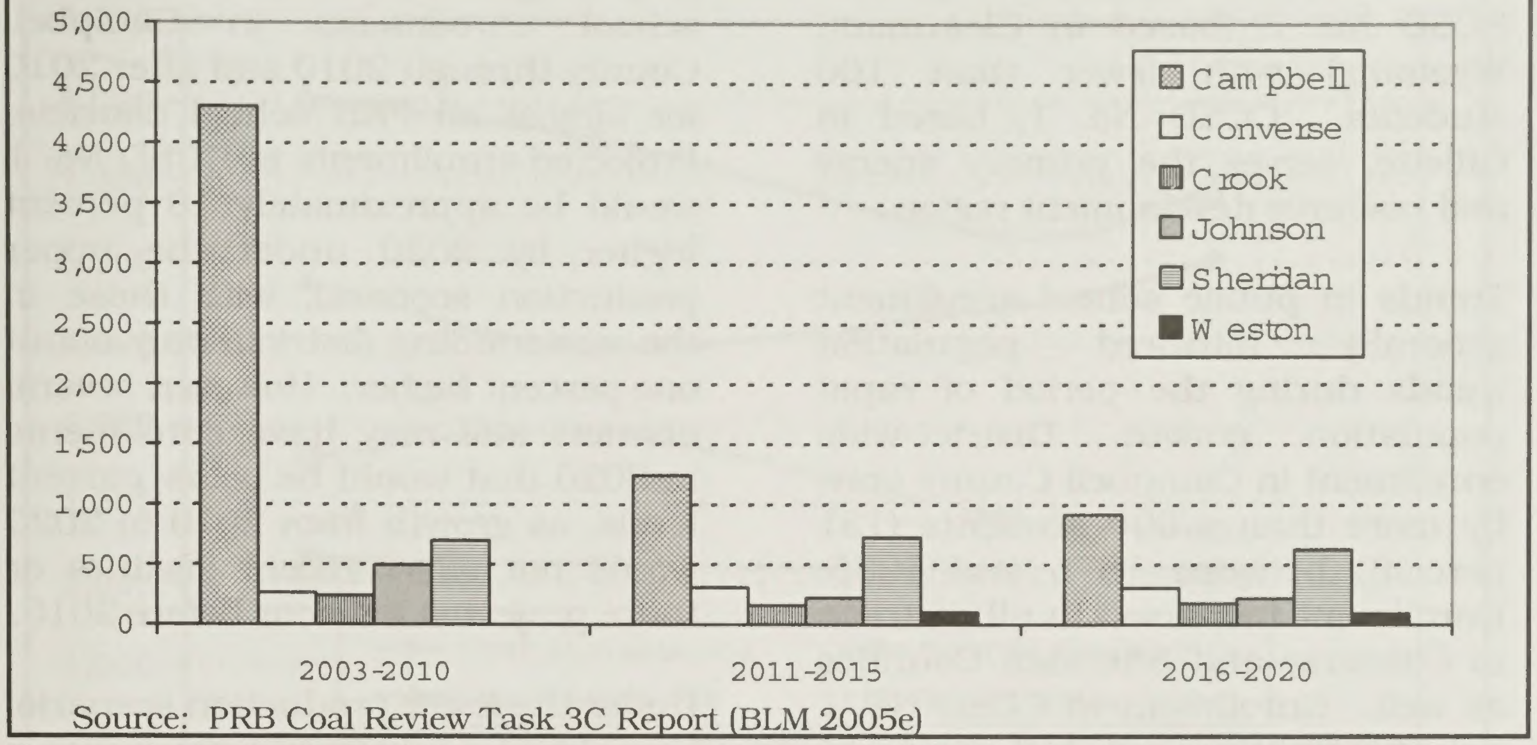
County	Apartments	Mobile Home Lots	Houses	Mobile Homes on a Lot
Campbell	$563	$228	$707	$590
Converse	$385	$150	$488	$374
Crook	$345	$120	-	-
Johnson	$443	$208	$606	$414
Sheridan	$465	$273	$667	$502
Weston	$333	$99	$380	$365
Wyoming	$466	$195	$658	$484

[1] 2003 data are for the fourth quarter.

Source: Wyoming Department of Administration and Information, Division of Economic Analysis (2004)

2003 (Figure 4-7). New housing requirements under the upper production scenario are estimated at 13,060 units, a 31 percent increase compared to the 2003 inventory and 1,790 units more than under the lower production scenario. From 2003 to 2010, the demand for new housing under the lower production scenario would concentrate in Campbell County, as approximately 60 percent of the overall demand for additional housing under either projected development scenario would occur in Campbell County, and approximately two-thirds of that (between 4,300 and 5,000 additional units) would be needed within the next three to five years.

A substantial portion of the near-term housing demand in Campbell County would be associated with the assumed concurrent construction of three power plants. If that occurs, one or more project sponsors may be required by the Wyoming Industrial Siting Administration to pro-actively provide housing (e.g., a construction camp for single-status workers). Such actions could temper the needs for additional housing; however, the remaining needs would nonetheless be substantial, straining public and private sector residential development capacity. Although smaller in scale than those in Campbell County, housing demands in the surrounding counties also could strain the capabilities of the



Source: PRB Coal Review Task 3C Report (BLM 2005e)

Figure 4-7. Projected Housing Demand in the PRB Study Area Under the Lower Production Scenario.

residential construction sector to respond. Furthermore, residential contractors would be competing for available labor, contributing to the population growth and housing demand, and fueling increases in construction costs and housing prices.

The relative scale of the housing needs may be evaluated in comparison to past growth in the study area. One benchmark for comparison is the rapid growth that occurred in the PRB in the 1970s. During that decade, the number of housing units in the six-county study area grew by approximately 14,900 units, approximately 1,500 units per year on average compared to the 850 to 975 new units per year projected under these scenarios through 2010. The rapid pace of development in the 1970s also coincided with a period of economic expansion and strained the region's construction trade and building supplier industries. Although the underlying economies of the region are larger now, the projected needs would tax the ability of communities to respond. Signs of strain are apparent in Gillette and could surface elsewhere as relatively more housing need would arise in the remaining counties of the six-county study area during the second five-year period under the low scenario.

Projected housing demands under either scenario, although lower than what Campbell County and the region experienced in the "boom" years of the 1970s, would exert substantial pressure on housing markets, prices, and the real estate development and construction industries, all at a time when demand for labor and other resources would be high overall.

4.2.12.6 Public Education

There are 10 school districts in the six-county PRB study area, ranging in size from CCSD No. 1 with 7,368 students in the 2003 school year to SCSD No. 3 (based in Clearmont, Wyoming) with fewer than 100 students. CCSD No. 1, based in Gillette, serves the primary energy and resource development region.

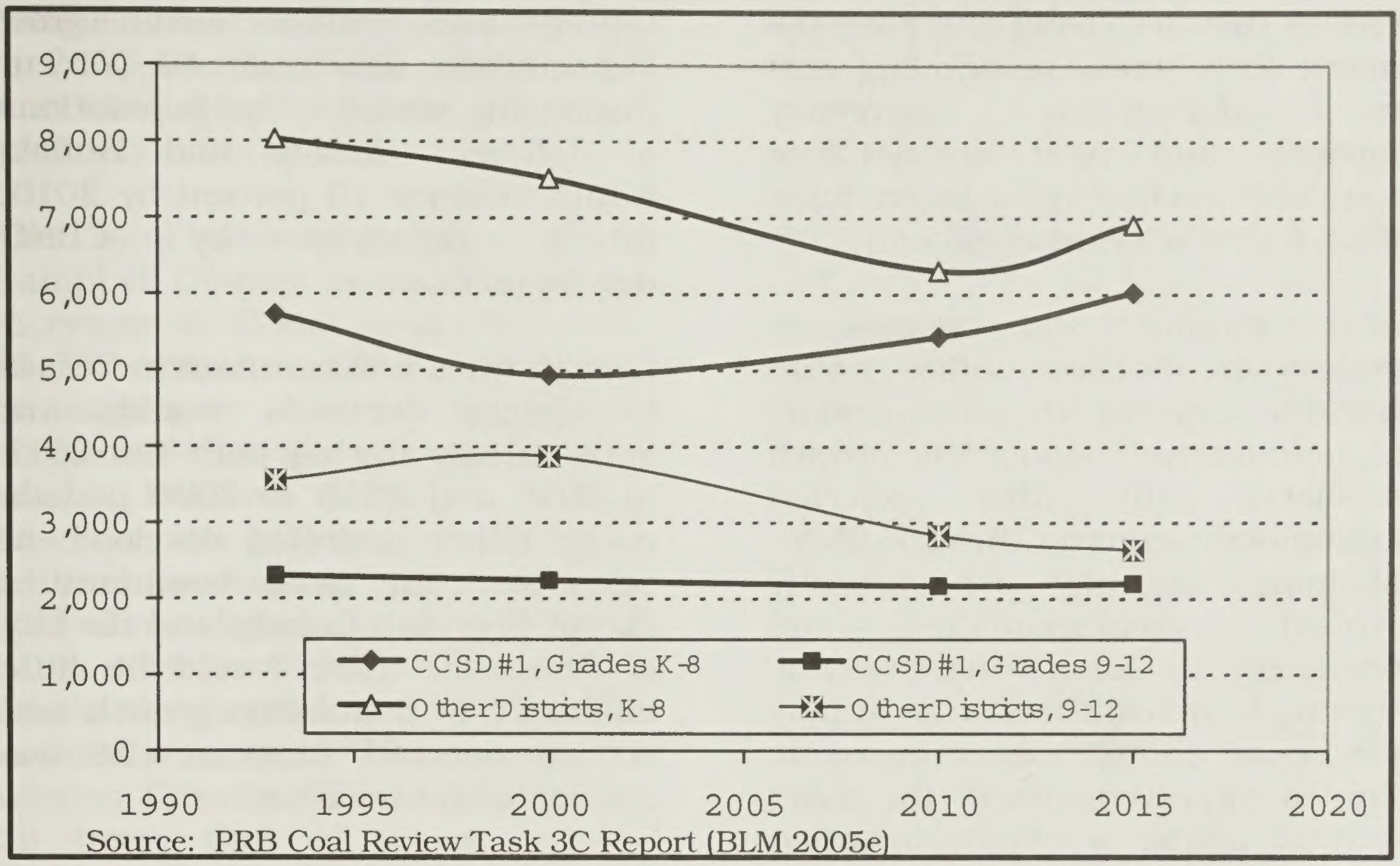
Trends in public school enrollment generally mirrored population trends during the period of rapid population growth. District-wide enrollment in Campbell County grew by more than 4,600 students (131 percent) between 1975 and 1985. Enrollment increased in all districts in Converse and Sheridan Counties as well. Enrollment in CCSD No. 1 subsequently peaked, but remained near the record high level for nearly a decade. Elsewhere in the region, enrollments generally have declined, and the combined enrollments in the study area's other districts is now below 10,000, its lowest level since 1975. Recent CBNG development has tempered, but not reversed, the trend of declining school enrollments across the region.

Communities across the PRB study area would see population growth due to economic migration from 2003 to 2020; however, the effect on public school enrollments would vary. As the demographic structure of the population changes, school districts in the PRB would be affected by new trends. In some counties, the size of that population (generally aged five to 17 years) may even trend in the opposite direction of total population in the short-term due to underlying demographics of the established resident population.

The demographic forecasts developed from the development scenarios project growth in the elementary school enrollments in Campbell County through 2010 and after 2010 for almost all PRB school districts. Projected enrollments in CCSD No. 1 would be approximately 10 percent higher by 2020 under the upper production scenario, with those in the surrounding districts only about one percent higher. However, several districts still may have enrollments in 2020 that would be below current levels, as growth from 2010 to 2020 would not offset recent declines or those projected to occur before 2010.

Under the lower production scenario, Campbell County would experience a substantial increase in school enrollment through 2020 (an added 1,587 students or 22 percent above recent levels). However, the impact on CCSD No. 1 would be composed of two trends, with a substantial increase in grades K-8 and small increases in grades 9-12 (Figure 4-8). School districts in the surrounding counties are projected to experience declining elementary and middle school enrollments through 2010 and declining high school enrollments through 2015. Thereafter, growth and the associated influences on demographics would generate renewed enrollment growth, particularly in the elementary grades in Johnson, Sheridan, and Converse Counties.

Under either scenario, projected enrollments may cause short-term school capacity shortages, depending on the specific grade-levels and residential locations of the additional students. Under the Wyoming School Facilities Commission planning guidelines,



Source: PRB Coal Review Task 3C Report (BLM 2005e)

Figure 4-8. Projected School Enrollment Trends to 2020 Under the Lower Production Scenario.

impacted school districts generally would be asked to accommodate minor capacity shortages through the use of temporary facilities, such as portable classrooms. For larger and more long-term increases, the Commission's policy is to fund capital expansion where warranted by projections developed during annual updates of school districts' five-year plans.

4.2.12.7 Facilities and Services

The types and levels of facilities and services provided by local governments reflect service demand, revenue availability, and community values regarding appropriate services and service levels. As with most socioeconomic characteristics, the level and availability of local government facilities and services varies by county and community across the PRB. There are literally several hundred different service providers in the region. Although all local government facilities and services are affected by energy development, the critical facilities and services include municipal water and sewer systems, law enforcement at the county level, and hospitals. A comprehensive inventory and assessment of facilities and services is beyond the scope of the PRB Coal Review socioeconomic analysis. However, an initial screening revealed no critical needs or shortfalls and indicated that most providers are engaged in an ongoing long-term process to maintain and improve facilities and services to meet community needs and to comply with various regulations and standards.

The PRB Coal Review socioeconomic analysis focuses on water supply and wastewater systems (two essential services that are costly and have the longest lead times to develop) and law enforcement, emergency response, and road maintenance (three services that typically are most affected by energy development).

Water supply and wastewater systems in all communities would have the capacity to accommodate the cumulative population growth associated with either projected development scenario through 2020, assuming ongoing or currently planned improvements are completed. In Gillette, there may be a timing issue with the water supply system, as completion of currently planned improvements in the 2005 to 2009 period would occur when substantial growth is anticipated to occur under both projected development scenarios. Consequently, Gillette may experience water shortages in the summer months during the 2003 to 2010 period, particularly under the upper development scenario.

The ability to provide desired levels of services to the anticipated energy-related population and development is less clear in Campbell County, Gillette, Wright, and outlying rural communities. Campbell County and its communities would experience a 25 percent increase in population between 2003 and 2010 under the lower production scenario and 30 percent under the upper production scenario.

Growth rates and the resultant facility and service demand in other counties within the study area would be substantially less during the 2003 to 2010 period under either scenario; all communities other than Johnson County and Buffalo would grow substantially less than 10 percent during the period. The populations of Johnson County and Buffalo would increase 10 percent by 2010, driven primarily by CBNG development.

Growth rates and resultant increases in service demands would slow substantially during both the 2011 to 2015 and 2016 to 2020 periods under either projected development scenario. In most communities except Sheridan County and the city of Sheridan, there would be little difference in population growth and service demand between the two development scenarios.

4.2.12.8 Fiscal Conditions

Federal mineral royalties and state and local taxes levied on coal and other mineral production are major sources of public revenue in Wyoming. Taxes, fees, and charges levied on real estate improvements, retail trade, and other economic activity supported by energy development provide additional revenues to support public facilities and services. These revenues benefit not only those jurisdictions within which the production or activity occurs, but also the federal treasury, state coffers, school districts, and local governments across the state through revenue-sharing and intergovernmental transfer mechanisms.

Coal and other minerals produced in Wyoming, regardless of ownership, are subject to ad valorum taxation by local taxing entities and a statewide levy to support public education. Statewide ad valorum taxable valuation on coal production in 2003 was $1,760.3 million. Of that total, 91 percent was based on production in the PRB.

The total assessed valuation of Campbell County, boosted by recent increases in CBNG production, was $2,687 million in 2003. Valuations on aggregate mineral production accounted for 82 percent of that total. Because Campbell County has been the primary beneficiary of mineral production gains over the past three decades and the recent gains tied to CBNG, the county's assessed valuation of $2,687 million in 2003 was nearly 35 times that of Weston County ($77.7 million) and 29 times that of Crook County ($92.1 million). The 2004 valuation of 2003 coal production in Campbell County was $1,561.2 million (Wyoming Business Council 2004).

Wyoming levies a severance tax on coal and many other minerals produced in the state. The severance tax rate, levied on the value of production, has varied from 1.0 percent to 10.5 percent over time. The rate has been 7.0 percent since 1992. Cumulative statewide severance tax proceeds total $2.22 billion since 1970. Cumulative severance tax revenues on coal produced in Campbell County total $1.42 billion. Cumulative severance tax revenues for the corresponding period total $67.4 million from Converse County, $60.5 million from Sheridan County, and $675.9 million from the remainder of the state.

Producers pay a 12.5 percent royalty to the federal treasury on the value of all surface coal production from federal leases. Half of this royalty is returned to the state. Cumulative royalty receipts on coal produced in Wyoming exceeded $2.76 billion between 1970 and 2003. Estimated 2004 mineral royalties from federal coal in Campbell County were about $268.3 million, based on an average sale price of $6.10 per ton of coal (WSGS 2006).

At the foundation of the mineral development revenue projections for the period 2003 to 2020 are projected levels of future energy and mineral resource production. The projected total value of annual mineral production under the lower production scenario will climb by $3.49 billion (2004 dollars) over 2003 levels, reaching $8.54 billion by 2020, a 69 percent increase over the current (2003) value. The aggregate value of energy and mineral resource production under the upper production scenario would increase to $9.21 billion in 2020. The incremental difference, compared to the value under the lower production scenario, would be $670 million per year, all of which represents the value of higher annual coal output.

Presently, the overwhelming majority of future mineral production value is anticipated to be in Campbell County. Over time, the future value of production in Sheridan and Johnson Counties would climb. Total annual mineral production value by 2020 is projected to reach $6.37 billion in Campbell County and $2.17 billion in the surrounding counties.

Between 2005 and 2020, total royalty and tax receipts derived from the key selected sources range between $21.1 and $22.6 billion for the lower and upper production scenarios, respectively. Receipts derived from coal production would account for the majority of the totals under either scenario, with federal mineral royalties on coal at $4.9 to $5.7 billion being the single largest source. Severance taxes, ranging from $6.3 to $6.7 billion, also would accrue to the state (Tables 4-32 and 4-33).

The federal and state governments also would benefit from coal lease bonus bids derived from future coal leasing. Bonus bids have risen over time, with one recent bid of almost $1.00 per ton range. There is no guarantee of that trend continuing. Considerable uncertainty also exists with respect to the timing and scale of future leases, although BLM currently has pending applications for more than 3 billion tons of federal coal (Table 1-2). The state also receives 50 percent of the bonus bid revenue.

Taxes and mineral royalties levied on energy and mineral resource production accruing to the state are disbursed to the Permanent Water Development Trust Fund, Wyoming School Foundation and Capital Facilities funds, capital construction fund for state and local government facilities, and other programs according to a legislatively-approved formula. Through these funds, the revenues derived from resource development benefit the entire state, not just agencies, businesses, and residents of the PRB.

County governments and school districts also would realize benefits from future energy and mineral resource development in the form of additional property taxes. Such taxes, estimated on the basis of future coal, oil, and natural gas production, are estimated to range between $5.4 billion and $5.7 billion through 2020. Those sums do not include future property taxes levied on the new power plants, expanded rail facilities, or new residential and commercial development associated with future growth, or sales and use taxes levied on consumer and some industrial purchases. These latter revenues are not estimated in this study, but would be substantially lower than those on resource production.

Local governments would benefit from property taxes on new development, as well as from sales and use taxes on taxable sales within their boundaries. Such revenues are not estimated for this study due to the large number of jurisdictions and other analytical considerations.

4.2.12.9 Social Setting

The past 30 years have seen sweeping social change in the U.S. and throughout much of the world. But in addition to the broad forces that have driven social change in the U.S. as a whole, social conditions in some PRB communities have been substantially influenced by energy development. Factors that have affected social conditions in the PRB include industrial and natural resource development, economic and demographic change, housing and public infrastructure development, and institutional change at the local and state government levels.

Table 4-32. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production Under the Lower Production Scenario (million $).

Industry and Taxes	2005-2010	2011-2015	2016-2020	Total
Coal[1]	$3,164.8	$3,178.9	$3,756.3	$10,100.0
CBNG	$2,915.2	$3,076.4	$3,288.7	$9,280.3
Conventional Oil and Gas	$568.5	$576.4	$614.0	$1,759.0
Totals	**$6,648.5**	**$6,831.7**	**$7,659.0**	**$21,139.3**
Severance Tax	$1,995.9	$2,012.4	$2,249.3	$6,257.6
Federal Mineral Royalties	$2,754.1	$2,839.4	$3,166.3	$8,759.8
State Mineral Royalties	$233.5	$225.8	$251.4	$710.7
Ad Valorum Tax (Counties)	$417.6	$443.0	$502.8	$1,363.3
Ad Valorum Tax (Schools)	$1,247.5	$1,311.1	$1,489.3	$4,047.9
Totals	**$6,648.6**	**$6,831.7**	**$7,659.1**	**$21,139.3**

[1] Does not include coal lease bonus bids due to the uncertainty regarding timing.

Source: PRB Coal Review Task 3C Report (BLM 2005e)

Table 4-33. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production Under the Upper Production Scenario (million $).

Industry and Taxes	2005-2010	2011-2015	2016-2020	Total[1]
Coal[1]	$3,538.0	$3,703.0	$4,350.0	$11,591.0
CBNG	$2,915.2	$3,076.4	$3,288.7	$9,280.3
Conventional Oil and Gas	$568.5	$576.4	$614.0	$1,759.0
Totals	**$7,021.7**	**$7,355.8**	**$8,252.7**	**$22,630.3**
Severance Tax	$2,104.1	$2,159.0	$2,415.4	$6,678.5
Federal Mineral Royalties	$2,946.3	$3,099.9	$3,461.4	$9,507.6
State Mineral Royalties	$233.5	$225.8	$251.4	$710.7
Ad Valorum Tax (Counties)	$435.8	$472.0	$535.0	$1,442.8
Ad Valorum Tax (Schools)	$1,302.3	$1,398.9	$1,589.8	$4,291.0
Totals	**$7,022.0**	**$7,355.6**	**$8,253.0**	**$22,630.6**

[1] Does not include coal lease bonus bids due to the uncertainty regarding timing.

Source: PRB Coal Review Task 3C Report (BLM 2005e)

One of the key drivers of social change in the PRB has been energy-related population growth. When the first oil boom occurred in the late 1950s, Campbell County was a relatively stable, sparsely-populated rural county. Like many places in Wyoming and throughout the rural west, Campbell County was a small, relatively homogeneous ranching community (ROMCOE 1982). The oil booms of the 1950s and 1960s brought an influx of new people. Development of coal mines, continued oil and gas drilling, and power plant construction precipitated another round of growth. In all, Campbell County population grew by almost 600 percent between 1950 and 2000.

On the one hand, this population growth, combined with a robust economy, generated a variety of positive social effects. Financial and technical resources poured into the community as it mobilized to accommodate the new population. Job opportunities were created in the construction industry, as the community responded to demands for housing, public facilities, and retail goods and services. The large and rapid influx of new residents, eager to take advantage of the employment opportunities, created energy, vitality, and sense of economic optimism about the community. Where economic advancement had been limited before the boom, there was now opportunity (Gardiner 1985).

On the other hand, it is likely that many residents had mixed feelings about these changes (Heinecke 1985). New residents brought new ideas, new ways of doing things, new preferences for goods and services, and new demands for government services. Some long-time residents, particularly those who were not directly participating in the economic benefits of energy development, viewed these changes as negative.

Today, almost any organization, committee, or government body is made up of a cross-section of energy employees, ranchers, and other community members whose tenure in the community may be long or short (Bigelow 2004, Spencer 2004). Moreover, because of the turnover in the energy companies, the community has become accustomed to newcomers.

Cumulative energy development in the PRB through the year 2020 has the potential to generate both beneficial and adverse effects on community social conditions. Social effects of development activities in the PRB would vary from county to county and community to community under the production scenarios developed for this study, based on the existing social setting and the type of development that would occur.

Beneficial social effects would be associated with an expanding economy and employment opportunities associated with energy development and resulting improvements in living standards for those employed in energy-related industries. Adverse social effects could occur as a result of conflicts over land use and environmental values. Negative social effects also could occur if the pace of growth exceeds the abilities of affected communities to accommodate energy-related employees and their families with housing and community services.

In the PRB, social conditions in Campbell County, the city of Gillette, and the town of Wright are most likely to be affected because the county would host much of the cumulative energy development workforce, and the county and its municipalities would receive the largest increments in population growth. Campbell County and its municipalities have a long history of energy development, and they have developed infrastructure and management systems to plan for and manage growth; consequently, major adverse social effects would not be anticipated. However, under either scenario, the county and the two municipalities may face challenges in providing adequate housing and expanding community services in anticipation of population growth through 2010, particularly if several power plant and coal mine construction projects occur simultaneously. As municipalities receive only sales and use tax revenues directly from development and purchases made within their boundaries, Gillette and Wright could face challenges in securing the necessary funding to improve municipal facilities and services. Housing shortages and limitations in public services could contribute to adverse community social effects in these communities.

Many of the people who would immigrate to Campbell County for energy-related jobs are likely to share characteristics with much of the current population; therefore, few barriers to social integration are anticipated.

Social effects on other communities in the PRB are likely to be minimal to moderate. Energy-related population growth is anticipated to be moderate in other communities. Sheridan County, also familiar with coal mining, is the only other county anticipated to host a major construction project under the development assumptions used for either projected development scenario. Converse, Weston, and Crook Counties could experience spillover growth from projects in Campbell County.

Johnson, Sheridan, and Campbell Counties could experience continued conflict over split estate and water issues associated with CBNG development, and the pace and scale of energy development across the PRB is likely to continue to generate social and political conflict over environmental issues under either scenario.

5.0 CONSULTATION AND COORDINATION

In addition to this EIS[1], other factors and consultations are considered and play a major role in determining the decision on this proposed lease application. These include the following.

Regional Coal Team Consultation

The Maysdorf coal lease application was reviewed and discussed at the May 30, 2002 PRRCT public meeting in Casper, Wyoming. CMC presented information about their existing mine and pending lease application to the PRRCT at that meeting. Voting and nonvoting members of the PRRCT include the governors of Wyoming and Montana, the Northern Cheyenne Tribe, the Crow Tribal Council, the USDA-FS, OSM, USFWS, NPS, and USGS. The PRRCT determined that the lands in the application met the qualifications for processing as a production maintenance tract. The PRRCT recommended that the BLM continue to process the Maysdorf lease application.

Governor's Consultation

The BLM Wyoming State Director notified the Governor of Wyoming on December 5, 2001 that CMC had filed a lease application with BLM for the Maysdorf LBA Tract.

Public Notice

A notice announcing the receipt of the Maysdorf coal lease application was published in the *Federal Register* on April 29, 2002. This notice also announced the date, time, and place of the PRRCT meeting to be held on May 30, 2002 to discuss this application. BLM published a Notice of Intent to Prepare an Environmental Impact Statement and Notice of Scoping in the *Federal Register* on February 1, 2005 and in the Gillette News-Record on January 25, 2005 and February 1, 2005. The publications served as public notice that the CMC coal lease application had been received, announced the time and location of a public scoping meeting, and requested public comment on the lease application.

Parties on the distribution list were sent letters announcing the time and location of a public scoping meeting in January 2005. The public scoping meeting was held on February 15, 2005 in Gillette, Wyoming. At the public meeting, the applicant orally presented information about the Cordero Rojo Mine and the need for the coal. The presentation was followed by a question and answer period, during which no oral comments were made. The scoping period extended from February 1 through April 8, 2005, during which time BLM received four written comments.

The EPA published a Notice of Availability in the *Federal Register* for the DEIS on May 26, 2006. The BLM published a Notice of Availability and

---

[1] Refer to page xv for a list of abbreviations and acronyms used in this document.

Notice of Public Hearing in the *Federal Register* for the DEIS on May 26, 2006. The 60-day comment period on the DEIS started with the publication of the EPA *Federal Register* Notice and ended on July 25, 2006. A formal public hearing was held on June 13, 2006 to solicit public comments on the DEIS and on the fair market value, the maximum economic recovery, and the proposed competitive sale of coal from the Maysdorf LBA Tract. BLM received written comments from five entities, which are included, with responses, in Appendix H of the FEIS. Parties on the distribution list will be sent copies of the FEIS when it is completed, and the EPA and BLM will publish a Notice of Availability for the FEIS. After a 30-day availability period, BLM will make a decision to hold or not to hold a competitive lease sale for the federal coal in this LBA tract and a ROD will be signed. Copies of the ROD will be mailed to parties on the mailing list and others who commented on this LBA during the NEPA process. After the ROD is signed, there will be a 30-day appeal period before the ROD is implemented.

Department of Justice Consultation

After a competitive coal lease sale, but prior to issuance of a lease, BLM will solicit the opinion of the Department of Justice on whether the planned lease issuance creates a situation inconsistent with federal anti-trust laws. The Department of Justice is allowed 30 days to make this determination. If the Department of Justice has not responded in writing within the 30 days, BLM can proceed with issuance of the lease

Other Consultations

Other federal, state, and local governmental agencies that were directly consulted in preparation of this EIS are listed in Table 5-1.

List of Preparers

This EIS was prepared by WWC Engineering, a third-party contractor, under the direction of the BLM. Representatives from cooperating agencies reviewed and contributed to the EIS. Tables 5-2 and 5-3 provide listings of the BLM, OSM, and WDEQ interdisciplinary team and the third-party consultant personnel who prepared and reviewed this EIS.

Distribution List

This EIS was distributed to Congressional offices, federal agencies, state governments, local governments, industry representatives, interest groups, and individuals for their review and comment (Tables 5-4a and 5-4b).

Table 5-1. Federal, State, Tribal, and Local Governmental Agencies.

Agency or Organization	**Individual**	**Position**
Powder River Regional Coal Team	5 Voting Members and 21 Nonvoting Members	
Wyoming Game and Fish Department	Lynn Jahnke	Wildlife & Fish Supervisor
	Bill Wichers	Deputy Director
	Vern Stelter	Wildlife Biologist
Wyoming Department of Environmental Quality/		
Air Quality Division	Bernard Daily	Program Manager for New Source Review Program
	Judy Shamley	Senior Analyst
	Darla Potter	NEPA & Policy Program Supervisor
	Cara Keslar	Monitoring Project Advisor
Land Quality Division	Donald McKenzie	District III Supervisor
Wyoming Department of Administration and Information	Wayne Liu	Division of Economic Analysis, Senior Economist
Wyoming Department of Revenue	Allen Black	Ad Valorum Tax Division, Administrator
	Randy Bolles	Mineral Tax Division, Administrator
Wyoming Employment Center	Betsy Hockert	Analyst
USDA/Natural Resources Conservation Service	Randy White	Soil Scientist
Tribal Governments		
Cheyenne River Sioux	Apache	
Crow	Kiowa	
Crow Creek Sioux	Comanche	
Eastern Shoshone		
Flandreau Santee Sioux		
Lower Brule Sioux		
Northern Arapaho		
Northern Cheyenne		
Oglala Lakota		
Rosebud Sioux		
Santee Sioux		
Southern Cheyenne/Southern Arapahoe		
Standing Rock Sioux		

Table 5-2. List of Contributors and Reviewers.

Name	Project Responsibility
	BLM Casper Field Office
Mike Karbs	Project Supervisor
	BLM Wyoming State Office
Bob Janssen	Coal Program Coordination
Janet Kurman	NEPA Coordination
Mavis Love	Land Adjudication
Susan Caplan	Air Quality and Climate
Rick Schuler	Water Resources
	BLM Wyoming Reservoir Management Group
Dwain McGarry	CBNG Geology
Lee Almasy	CBNG Reservoir Engineering
	BLM Buffalo Field Office
B.J. Earle	Cultural Resources
Tom Bills	Wildlife Resources
	BLM National Science and Technology Center
Craig Nicholls	Air Quality and Climate
Paul Summers	Water Resources
	Office of Surface Mining Reclamation and Enforcement Western Regional Coordinating Center
Floyd McMullen	EIS Project Coordinator
	Wyoming State Planning Office
Ben Brandes	Coal Issues Coordination
	Wyoming Department of Environmental Quality
Kathy Muller Ogle	CHIA Program Supervisor
Darla Potter	NEPA & Policy Program Supervisor
	ENSR International Powder River Basin Coal Review
Valerie Randall	Project Manager
Dolora Koontz	Assistant Project Manager and Task 2 Manager (Existing Development and Reasonably Foreseeable Development)
Eldon Strid, Matt Reilly	Existing and Projected Coal Development and Coal Transportation Scenarios
Doree Dufresne	Database Development
Bruce MacDonald, PhD	Air Quality
Robert Berry, PhD	Water Resources

Table 5-2. List of Contributors and Reviewers (Continued).

ENSR International **Powder River Basin Coal Review (Continued)**	
James Rumbaugh	Ground Water Modeling
Brad Anderson	Surface Water
Ron Dutton, George Blankenship	Socioeconomics
Bernhard Strom	Land Use, Transportation, and Utilities
William Berg	Topography, Geology, and Minerals
James Burrell, James Nyenhuis	Soils and Alluvial Valley Floors
Jon Alstad	Vegetation, Wetlands, and Grazing
Charles Johnson	Wildlife
Rollin Daggett	Fisheries
Kim Munson	Native American Concerns, and Paleontological Resources

Table 5-3. List of Preparers.

Name	Education/Experience	Responsibility
	BLM Casper Field Office	
Nancy Doelger	M.S., B.S. Geology, 30 years professional experience	EIS Project Leader/Editor
	WWC Engineering Third-Party Contractor	
Ken Collier	B.S. Geology, 27 years professional experience (Licensed Wyoming Geologist)	Project Management Report Preparation
John Berry	B.S. Wildlife Biology, 26 years professional experience	Report Preparation
Heidi Robinson	15 years professional experience	Document Production
Mal McGill	5 years professional experience	CADD
	Intermountain Resources Subcontractor for WWC	
Jim Orpet	M.S., B.S. Wildlife Management, 26 years professional experience	Wildlife Resources
Russell Tait	B.S. Wildlife Management, 13 years professional experience	Wildlife Resources
	Aqua Terra Consultants Subcontractor for CMC	
Steve Stresky	B.S. Geology, M.S. Hydrology, 18 years professional experience	Environmental Resources
	TRC Mariah Associates, Inc. Subcontractor for WWC	
Edward Schneider	B.A., M.A. Anthropology, 20 years professional experience	Cultural Resources
	Erathem-Vanir Geological Subcontractor for WWC	
Gustav Winterfeld	B.S. Zoology, M.A., Ph.D. Geology, 29 years professional experience	Paleontological Resources

Table 5-4a. BLM Distribution List for Coal Leasing.

Federal & State Officials
Governor of Wyoming Dave Fruedenthal
Governor of Montana Brian Schweitzer
U.S. Representative Barbara Cubin
U.S. Senator Craig Thomas
U.S. Senator Mike Enzi
Wyoming Senator Michael Von Flatern
Wyoming Senator John Hines
Wyoming Representative Thomas Lubnau
Wyoming Representative Erin Mercer
Wyoming Representative Sue Wallis

Federal Agencies
BLM, Washington D.C.
BLM, Buffalo WY
BLM, Casper WY
BLM, Billings MT
BLM, Miles City MT
BLM, Cheyenne WY
Bureau of Indian Affairs, Washington D.C.
Bureau of Indian Affairs, Billings MT
Bureau of Reclamation
Department of Energy
Department of Interior
HQ-USAF/CEVP
Mineral Management Service
National Park Service, Washington D.C.
National Park Service, Denver CO.
Devils Tower National Monument
OSM, Washington D.C.
OSM, Western Region, Denver CO
OSM, Casper WY
USDI Rocky Mountain Regional Solicitor
U.S. Army Corps of Engineers, Cheyenne WY
U.S. EPA Region VIII, Denver CO
U.S. Fish & Wildlife Service, Arlington, VA
U.S. Fish & Wildlife Service, Cheyenne WY
U.S. Geological Survey, Reston VA
U.S. Geological Survey, Denver CO
U.S. Geological Survey, Cheyenne WY
USDA-Forest Service, Douglas WY
USDA-Forest Service, Washington D.C.
USDA-Forest Service, Denver CO

State Agencies
Montana Office of the Governor
Wyoming State Lands and Investment Office
Wyoming Treasurer's Office
WY Employment Research & Planning Dept.
Wyoming Department of Education
Wyoming Dept. of Environmental Quality
Wyoming Division of Economic Analysis
Wyoming State Planning Office
Wyoming Oil and Gas Conservation Comm.
Wyoming Parks & Cultural Resources Dept.
Wyoming State Engineer's Office
Wyoming Department of Transportation
Wyoming State Historic Preservation Office
Wyoming Game & Fish Department
Wyoming Business Council
Wyoming Department of Agriculture
Wyoming Industrial Siting Division
Wyoming Public Service Commission
Wyoming State Geological Survey
Wyoming State Inspector of Mines
Wyoming Water Development Commission

Local Agencies and Government
Big Horn County, Montana Planning Board
Campbell Co., WY Board of Commissioners
Campbell Co., WY Conservation District
Campbell Co., WY School Superintendent
City of Gillette, Wyoming
Gillette Dept. of Community Development
Powder River County, Montana
Rosebud County, Montana Commission
Town of Wright, Wyoming
Weston Co., WY Board of Commissioners

Native American Tribal Organizations
Apache Tribe of Oklahoma
Arapahoe Business Council
Cheyenne River Sioux Tribal Council
Comanche Business Committee
Crow Tribal Council
Crow Creek Sioux Tribe
Flandreau Santee Sioux Tribe
Kiowa Business Committee
Lower Brule Sioux Tribal Council
Northern Cheyenne Tribal Council
Oglala Sioux Tribal Council
Rosebud Sioux Tribal Council
S. Cheyenne/S. Arapaho Tribes
Santee Sioux Tribal Council
Shoshone Business Council
Standing Rock Sioux Tribal Council
Standing Rock Sioux Tribe

Table 5-4a. BLM Distribution List for Coal Leasing (Continued).

Organizations
Advisory Council on Historic Preservation
Biodiversity Conservation Alliance
Campbell County Economic Dev. Corp.
Converse Area New Dev. Organization
Foundation for N. American Wild Sheep
Izaak Walton League of America
Medicine Wheel Coalition
National Mining Association
National Wildlife Federation
Natural Resources Defense Council
Petroleum Association of Wyoming
Powder River Basin Resource Council
Sierra Club
Thunder Basin Coalition
Wildlife Management Institute
Wyoming Assoc of Professional Archeologists
Wyoming Bankers Association
Wyoming Business Alliance
Wyoming Mining Association
Wyoming Outdoor Council
Wyoming Stock Growers Association
Wyoming Wildlife Federation
Wyoming Wool Growers Association

Companies/Businesses
All American Equipment
American Colloid Company
Antelope Coal Company
Ark Land Company
Arnjac
Bjork, Lindley, Little, P.C.
Bridgeview Coal Company
Buckskin Mine
Burlington Northern Santa Fe Railroad Co.
Burns & McDonnell
C.H. Snyder Company
CE&MT, Incorporated
Consol, Inc., Exploration & Land Dept.
Cordero-Rojo Mine
Decker Coal Company
Dry Fork Coal Company
Ducker, Montgomery, Lewis, & Aronstein
Environmental Solutions, Inc.
Evergreen Enterprises
Foster-Wheeler Environmental
Foundation Coal West, Incorporated
Great Points Energy
Hardin & Associates
Intermountain Resources
Interwest Mining Company
Jacobs Ranch Coal Corporation
Kenneth R. Paulsen Consultants
Kiewit Mining Company
KN Energy
L.E. Peabody & Associates
M&K Oil Company, Incorporated
Marston & Marston
McGraw-Hill
McVehil-Monnett Associates, Inc.
Meineadair Consultants
Mine Engineers, Incorporated
Mining Associates of Wyoming
NERCO Coal Company
Norwest Corporation
P&M Coal Mining Company
Peabody Energy Company
Powder River Coal Company
Powder River Energy Corporation
Rio Tinto Energy America, Inc.
Riverside Technology, Incorporated
Royal Gold Incorporated
San Juan Coal Company
Thunder Basin Coal Company
Thunderbird Jones and Stokes
TRC Environmental
URS Greiner Woodward Clyde
U.S. West Communications
Union Pacific Railroad
Western Energy Company
Western Fuels Association
WWC Engineering
Wyodak Resources Dev. Corporation
Yates Petroleum Company, et al.

Press
Associated Press
Casper Journal
Casper Star Tribune
Cheyenne-Wyoming Eagle
Douglas Budget
Gillette News-Record
Rocky Mountain Oil Journal
Western Coal Newsletter

Educational Institutions
Northwestern Univ. Policy Research Inst.
UW Libraries, Coe Reference Department
CSU, The Libraries

Individuals
Barbero, Ralph
Benson, Scott
Bierman, Sheldon
Cundy, Cecil
Daub, Jerry
Nyenhuis, Jim
Papp, Alex
Saulcy, Bill
Williams, John
Winland, Mark

Table 5-4b. Distribution List for Final EIS, Maysdorf Coal Lease Application.

Individuals

Atkins, Mary A.
Ballard, Lexi
Bell, Sammy S., Jr.
Burch, George Ann
Clabaugh, Bonnie, Trust
Clabaugh, Glenn, et al.
Coltrane, Mary K. Wagensen
Davis, Marjorie L. Brandner
Drane, Donna R.
Dunlap, Helen J
Duvall, Kenneth R., Trust
Duvall, Norma L., Trust
Evans, Tanya L. and
Fisher, Leslie J. Wagensen
Floyd, Fred, Jr.
Garrett, Tess, Trust
Garrett, Labin, Trust
Garrett, Peter, Trustee
Graham, Helen Clabaugh
Haight, Bruce L., Trust
Haight, Jillaine L., Trust
Haight, Leslie E and Sandra K
Haight, Macsy, et al.
Haight, Mark T. and Deena R.
Hayden, Alta V.
Hayden, Gary
Hayden Kerry
Hayden, Randy L.
Hayden, Tony
Hayden, Troy
Knapp, Everett D., et ux
Knapp, Joseph M., et ux
Mankin, Aline E. and John A., Trust
Mankin, Karen
Peters, Margaret Z., et al.
Pittman, Ginger A.
Riggle, Kenton L.
Rudebush, Betty L.
Sachau, B.
Shaddock, Steven
Stock, Christopher R. & Barbara J.
Tarver, Timothy
Thrush, Earl D., et al.
Wilmot, Neva
Wilson, Ira D., Trustee
Winninger, Lora

Businesses and Organizations

A.G. Andrikopoulos Resources, Inc.
Bowden Energy Company
Chaco Energy Company
Club Oil & Gas, Ltd.
DCD, Inc.
Duncan Oil, Inc.
Dunlap Farms
Dunlap Investments
Flying T Land Co. LP., et al.
Foundation Wyoming Land Co.
Freeman Investments
Keidel Family LP
Key Production Company, Inc.
Lance Oil and Gas Company
Little Buffalo Ranch LLC, et al.
Mankin Land LP
Marquiss Minerals, Inc.
NPC, Inc.
Pickrel Land and Cattle Company.
Production Development Corp.
RHD Coal Partners LLC
Rocky Mountain Gas, Inc.
Seyon LLC
T-7 Ranch LLC
T-7 Ranch LP
Warren Exploration & Production

6.0 REFERENCES CITED

Argonne, 2002, Technical Support Document - Air Quality Impact Assessment for the Montana Statewide Oil and Gas Final Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans and the Wyoming Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project. Prepared for the U.S. Department of the Interior, Bureau of Land Management, Montana and Wyoming State Offices, by the Environmental Assessment Division, Argonne National Laboratory. Argonne, Illinois.

Avian Power Line Interaction Committee (APLIC), 1994, Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington, D.C.

______, 1996, Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996. Edison Electric Institute and the Raptor Research Foundation, Washington, D.C.

Bigelow, S., 2004, Personal communication between S. Bigelow, Executive Director, Campbell County Economic Development Corporation, and G. Blankenship, Blankenship Consulting, LLC, July 9, 2004.

Borden, G.W., R.R. Fletcher, and D.T. Taylor, 1994, Economic Impact of Coal on Wyoming's Economy, Cooperative Extension Service Department of Agricultural Economics, College of Agriculture, University of Wyoming, B-987.

Braun, C.E., 1998, Sage Grouse declines in western North America: What are the problems? Proceedings of the Western Associated of Fish and Wildlife Agencies 78:139-156.

Braunlin, Deanna, 2004, Campbell County Planner. Gillette, Wyoming. Personal communications with B. Strom, Planera, Inc. November 18, 2004.

Bureau of Land Management (BLM), 1974, Final Environmental Impact Statement, Eastern Powder River Basin of Wyoming. U.S. Department of the Interior, Bureau of Land Management, Cheyenne, Wyoming.

______, 1979, Final Environmental Impact Statement, Proposed Development of Coal Resources in the Eastern Powder River Wyoming. U.S. Department of the Interior, Bureau of Land Management, Washington, D.C.

______, 1981, Final Powder River Regional Coal Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Cheyenne, Wyoming.

_____, 1983, Final Environmental Impact Statement on the Riley Ridge Natural Gas Project, Sublette, Lincoln, and Sweetwater Counties, Wyoming. BLM-YA-EA-84-002-1327. U.S. Department of the Interior, Bureau of Land Management, Cheyenne, Wyoming.

_____, 1984, Draft Environmental Impact Statement for Round II Coal Lease Sale in the Powder River Region. U.S. Department of the Interior, Bureau of Land Management, Cheyenne, Wyoming.

_____, 1985, Buffalo Resource Area Resource Management Plan Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Buffalo Resource Area, Casper, Wyoming.

_____, 1988, NEPA Handbook H-1790-1. U.S. Department of the Interior, Bureau of Land Management, Washington, D.C.

_____, 1989, Manual 3420, Competitive Coal Leasing. U.S. Department of the Interior, Bureau of Land Management, Washington, D.C.

_____, 1991, Powder River Regional Coal Team Operational Guidelines for Coal Lease-By-Applications. U.S. Department of the Interior, Bureau of Land Management, Cheyenne, Wyoming.

_____, 1992, Final West Rocky Butte Coal Lease Application Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.

_____, 2001a, Approved Resource Management Plan for Public Lands Administered by the Bureau of Land Management Buffalo Field Office. U.S. Department of the Interior, Bureau of Land Management, Buffalo Field Office, Buffalo, Wyoming. Available from website on the Internet as of March 2005: <http://www.wy.blm.gov>.

_____, 2001b, Final Environmental Impact Statement for the North Jacobs Ranch Coal Lease Application (WYW146744). U.S. Department of the Interior, Bureau of Land Management, Casper Field Office, Casper, Wyoming.

_____, 2001c, Reasonably Foreseeable Development Scenario for Oil and Gas Development in the Buffalo Field Office Area, Campbell, Johnson and Sheridan Counties, Wyoming.

_____, 2003a, Final South Powder River Basin Coal Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Buffalo Field Office, Buffalo, Wyoming, December 2003.

_____, 2003b, Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project. U.S. Department of the Interior, Bureau of Land Management, Buffalo Field Office, Buffalo, Wyoming, January 2003.

_____, 2005a, Task 1A Report for the Powder River Basin Coal Review – Current Air Quality Conditions. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, Colorado, September 2005.

_____, 2005b, Task 1C Report for the Powder River Basin Coal Review – Current Social and Economic Conditions. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, Colorado, March 2005.

_____, 2005c, Task 1D Report for the Powder River Basin Coal Review – Current Environmental Conditions. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, Colorado, June 2005.

_____, 2005d, Task 2 Report for the Powder River Basin Coal Review – Past and Present and Reasonably Foreseeable Development Activities. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, Colorado, December 2005.

_____, 2005e, Task 3C Report for the Powder River Basin Coal Review – Cumulative Social and Economic Effects. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, Colorado, December 2005.

_____, 2005f, Task 3D Report for the Powder River Basin Coal Review – Cumulative Environmental Effects. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, Colorado, December 2005.

_____, 2006a, Instruction Memorandum No. 2006-153. Policy and Guidance on Conflicts between Coalbed Natural Gas and Surface Coal Mine Development in the Powder River Basin. Reissued May 11, 2006.

_____, 2006b, Task 3A Report for the Powder River Basin Coal Review – Cumulative Air Quality Effects. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, Colorado, February 2006.

______, 2006c, Powder River Basin Coal Leases by Application Data Sheets. Available from website on the Internet as of January 2006: <http://www.wy.blm.gov/minerals/coal/prb/LBA_title.htm>.

______, In Preparation, Task 1B Report for the Powder River Basin Coal Review – Current Water Resource Conditions. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, Colorado.

______, In Preparation, Task 3B Report for the Powder River Basin Coal Review – Cumulative Water Effects. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation

Byer, Tim, USDA Forest Service Wildlife Biologist, Douglas Ranger District, Douglas, Wyoming, personal communication September 11 and 29, 2003.

Caballo Rojo, Inc. (CRI), 2002, Caballo Rojo Mine Permit, WDEQ/LQD Surface Mine Permit No. 511-T6, approved May 1, 2002. On file with WDEQ/LQD, Cheyenne and Sheridan, Wyoming.

______, 2004, Caballo Rojo Mine 2003-04 Annual Report. On file with WDEQ/LQD, Cheyenne and Sheridan, Wyoming.

Campbell County, 2005, Multi-Hazard Mitigation Plan for Campbell County, Town of Wright and City of Gillette. Prepared by Beck Consulting. Draft – November 2005. Available from website on the Internet as of December 2005: <http://ccg.co.campbell.wy.us/>.

Campbell County Economic Development Corporation (CCEDC), 2006, 2005 Economic Conditions and Outlook, updated January 2006. Available from website on the Internet as of January 2006: <http://www.ccedc.net/data.html>.

Campbell County Memorial Hospital (CCMH), 2005, Campbell County Memorial Hospital Web Site. Gillette, Wyoming. Available from website on the Internet as of March 2005: <http://www.ccmh.net>.

Campbell County School District No. 1 (CCSD), 2005, Facts About Campbell County School District. Available from website on the Internet as of March 2005: <http://esc.ccsd.k12.wy.us/hr/distinfo.html>.

CAM-PLEX, 2005, CAM-PLEX Multi-Event Facilities. (Brochure) Gillette, Wyoming. Available from website on the Internet as of November 2005: <http://www.cam-plex.com>.

Casper Star Tribune, 2003, "Eagle Butte wins on EQC ruling", by Brodie Farquhar, January 18.

Cerovski, A.M., G.T. Byer, K. Duffy, and D. Felley, 2000, Wyoming Bird Conservation Plan, Version 1.0, Wyoming Partners in Flight, Lander, Wyoming.

Chancellor, Rick, 2003, WDEQ, personal communication, June 16.

Christensen, R., 2002, Personal communication between R. Christensen, WDEQ/LQD, Cheyenne, Wyoming and C. Florian, Greystone Environmental Consultants, regarding summary report of coal permit totals to date: Active Coal Mine Permits, Powder River Basin, 1999-2001, July 31, 2002.

Christiansen, Tom, 2004, Wyoming Greater Sage-Grouse Population Trend Relative to the 2005 Hunting Season – A Summary Report and Recommendation. Available from website on the Internet as of March 2005: <http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/index.asp>. (See 2005 Hunting Summary and Recommendations).

City of Gillette, 1978, City of Gillette/Campbell County Comprehensive Planning Program. June 1978. Updated March 1994. Gillette, Wyoming.

_____, 2007, Department of Community Development, Planning Division, 2006 Housing and Demographics Survey, January-December 2006, January 2007.

Clark, D.W., 1995, Geotechnical processes in ground water resulting from surface mining of coal at the Big Sky and West Decker Mine area, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Report 95-4097, 80 p.

Commonwealth Associates, Inc., 1980, Environmental Baseline Study, Antelope Coal Field.

Connelly, J.W., S.T. Knick, M.A. Schroedoer, and S.J. Stiver, 2004, Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies, unpublished report, Cheyenne, Wyoming.

Cordero Mining Company (CMC), 1999, Air Quality Permit Application for the Cordero Rojo Complex to combine the

Caballo Rojo and Cordero Mines, Permit No. MD-457A, prepared for CMC by McVehil-Monnett Associates, Inc., January 1999.

______, 2004a, Cordero Mine Permit, WDEQ/LQD Surface Mine Permit No. 237-T7, approved September 16, 2004. On file with WDEQ/LQD, Cheyenne and Sheridan, Wyoming.

______, 2004b, Cordero Mine 2003-04 Annual Report. On file with WDEQ/LQD, Cheyenne and Sheridan, Wyoming.

Community Strategies Institute (CSI), 2005, Campbell County Housing Needs Assessment. Prepared for the Campbell County Economic Development Corporation. Denver, Colorado. January 2005.

Crist, M.A., 1991, Evaluation of groundwater-level changes near Gillette, northeastern Wyoming. U.S. Geological Survey, Water Resources Investigations Report 88-4196.

De Bruin, R.H. and R.M. Lyman, 1999, Coalbed Methane in Wyoming. Pages 61-72 in: Coalbed Methane and Tertiary Geology of the Powder River Basin of Wyoming and Montana. Wyoming Geological Association 50th Field Conference Guidebook.

Delson, E., 1971, Fossil Mammals of the Early Eocene Wasatchian Powder River Local Fauna, Eocene of Northeast Wyoming. American Museum of Natural History Bulletin, Vol. 146, pp. 305-364.

Erathem-Vanir Geological PPLLC (EVG), 2001, Paleontological Inventory and Evaluation 2001 Baseline Survey, Cordero Mining Company, Campbell County, Wyoming. Prepared for TRC-Mariah & Associates, Inc. (Laramie, WY), 8 p.

Emme, Doug, 2003, WDEQ/LQD Blasting Program Principal, personal communication, May 7.

Federal Energy Regulatory Commission (FERC) , 2004, "Major Pipeline Projects on the Horizon as of February 2004". Available from website on the Internet as of February 2004: <http://www.ferc.gov/for-citizens/projectsearch/Search Projects aspx>.

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong, 1994, Mammals of Colorado. Denver Museum of Natural History, Denver, Colorado.

Flores, R.M., A.M. Ochs, L.R. Bader, R.C. Johnson, and D. Vogler, 1999, Framework Geology of the Fort Union Coal in the Powder River Basin, Wyoming and Montana. Chapter PF, pages 1-40, *in* Fort Union Coal Assessment Team. 1999 Resource Assessment of Selected Tertiary Coal Beds and Zones in the Northern Rocky Mountains and Great

Plains Region. U.S. Geological Survey Professional Paper 1625-A, Chapter PF.

Flores, R.M., G.D. Stricker, J.F. Meyer, T.E. Doll, P.H. Norton, Jr., R.J. Livingston, and M.C. Jennings, 2001, A Field Conference on Impacts of Coalbed Methane Development in the Powder River Basin. U.S. Geological Survey Open-File Report 01-126.

Foundation Coal West, Inc., 2003, Belle Ayre Mine Permit, WDEQ/LQD Surface Mine Permit No. 214-T6, Appendix 4-6-2, Volume 13. Results of Aquifer Tests Preformed on Selected Backfill Wells at the Belle Ayre Mine, Western Water Consultants, 1993. On file with WDEQ/LQD in Cheyenne and Sheridan, Wyoming.

Frankel, A.C., C. Mueller, T. Barnhand, D. Perkins, E.V. Leyendecker, N. Dickman, S. Hanson, and M. Hopper, 1997, Seismic-hazard Maps for the Coterminous United States, Map F - Horizontal Spectral Response Acceleration for 0.2 Second Period (5% of critical damping) with 10 % Probability of Exceedance in 50 Years. U.S. Geological Survey Open-File Report 97-131-F.

Frison, George, 1978, *Prehistoric Hunters of the High Plains.* Academic Press: New York, New York.

______, 1991, *Prehistoric Hunters of the High Plains.* Academic Press: New York, New York.

______, 2001, Hunting and Gathering Tradition: Northwestern and Central Plains, *in* Plains, edited by Raymond J. DeMaille, pp. 131-145. Handbook of the North American Indians, Vol. 13, Part I, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Gardiner, S., 1985, editor, Rumblings from the Razor City: The Oral History of Gillette, Wyoming, an Energy Boomtown.

Gillette Convention and Visitor's Bureau, 2004, "Gillette, Wyoming – Take Another Look!" (Brochure). Gillette, Wyoming.

Gillette News-Record, 2006a, "Weary travelers compete with workers who need a place to stay", by Kelsey Dayton, July 10.

______, 2006b, "Elementary schools expected to be crammed", by Christa Meland, August 1.

______, 2007, "Population surge", by J.D. Stetson, January 25.

Heffern, E.L. and D.A. Coats, 2000, Hydrogeology and Ecology of Clinker in the Powder River Basin, Wyoming and Montana, Plate 1, *in* 50th Annual Field Conference Guidebook, pp. 231-252.

Wyoming Geological Association, Casper, Wyoming.

Heinecke, B., 1985, Director Mental Health Service, Northeast Wyoming Mental Health Center, Oral History in Rumblings from Razor City: The Oral History of Gillette, Wyoming, an Energy Boomtown. Edited by S. Gardiner.

HKM Engineering, Inc., Lord Consulting, and Watts and Associates, 2002a, Powder/Tongue River Basin Plan. Prepared for Wyoming Water Development Commission Basin Planning Program, February 2002.

_____, 2002b, Northeast Wyoming River Basins Plan. Prepared for Wyoming Water Development Commission Basin Planning Program, February 2002.

Hodson, W.G., R.H. Pearl, and S.A. Druse, 1973, Water Resources of the Powder River Basin and Adjacent Areas, Northeastern Wyoming. U.S. Geological Survey Hydrologic Investigations Atlas HA-465.

Holcomb, J., 2003, Rocky Mountain Pipeline Assessment, prepared for PACE Global Energy Services and presented at the Rocky Mountain Association of Geologists and Petroleum Technology Transfer Council CBM Symposium, Denver, Colorado, June 10, 2003.

Hydro-Engineering, 1991, GAGMO 10-Year Report. Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC, Casper, Wyoming.

_____, 1996, GAGMO 15-Year Report. Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC, Casper, Wyoming.

_____, 2000, 2000 GAGMO Annual Report. Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC, Casper, Wyoming.

_____, 2001, GAGMO 20-Year Report. Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC, Casper, Wyoming.

_____, 2004, 2004 GAGMO Annual Report. Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC, Casper, Wyoming.

IHS Energy Services (IHS), 2004, Oil and Gas Production and Well History Database.

IMPROVE, 2005, IMPROVE Summary Data – Summary data through 2003 (Updated February 2005). Available from website on the Internet as of as of April 2005: <http://vista.cira.colostate.edu/improve/Data/IMPROVE/summary_data.htm>.

Intermountain Resources, 1987-2005, Caballo Rojo and Cordero Mine's Annual Wildlife Monitoring Reports, submitted to WDEQ/LQD and on file in Sheridan and Cheyenne, Wyoming offices.

Jahnke, L., 2005, Personal communication between L. Jahnke, Wildlife Management Coordinator, Wyoming Game and Fish Department, Sheridan, Wyoming and B. Strom, ENSR, May 20, 2005.

Knopf, F.L., 1996, Mountain plover (*charadrius montanus*), *in* The Birds of North America, No. 211 (A. Poole and F. Gills, eds.). The Academy of Natural Sciences, Philadelphia, PA and the American Ornithologist's Union, Washington, D.C.

Law, B.E., 1976, Large-scale compaction structures in the coal/bearing Fort Union and Wasatch Formations, northeast Powder River Basin, Wyoming: in *Wyoming Geological Association:* Guidebook on geology and energy resources of the Powder River Basin, pp. 221-229.

Lewis, B.D. and W.R. Hotchkiss, 1981, Thickness, percent sand, and configuration of shallow hydrogeological units in the Powder River Basin, Montana and Wyoming. U.S. Geological Survey, Misc. Investigations Series Map I-1317.

Lockman, Christy, 2004, Data provided by USDA Forest Service. Graph taken from Little Thunder LBA Record of Decision, USDA Forest Service, Douglas, Ranger District, Douglas, Wyoming.

Luce, B., A. Cerovski, B. Oakleaf, J. Priday, and L. Van Fleet, 1999, Atlas of Birds, Mammals, Reptiles, and Amphibians in Wyoming. Wyoming Game and Fish Department, Wildlife Division, Cheyenne, Wyoming.

Martin, L.J., D.L. Naftz, H.W. Lowham, and J.G. Rankl, 1988, Cumulative potential hydrologic impacts of surface coal mining in the eastern Powder River Structural Basin, northeastern Wyoming (CHIA). U.S. Geological Survey, Water Resources Investigations Report 88-4046. Prepared in cooperation with WDEQ and OSM, Cheyenne, Wyoming.

Martin, W., 1999, Archaeological Investigations Along the Wyoming Segment of the Express Pipeline, *in* Contributions to Archaeology, Volume 5. Project Synthesis, pp. 4-1, 4-22. William Martin and Craig S. Smith, series editors. TRC Mariah Associates Inc., Laramie, Wyoming.

McVehil-Monnett Associates, Inc., 1997, NO_2 Concentrations in Northeastern Wyoming: Historical Data and Projections. Report prepared and submitted to WDEQ/AQD July 1997.

Mine Safety and Health Administration (MSHA), 1997, 645 Database, Wyoming Summary Employment and Injury Information.

Morovits, Pam, 2005, Senior Water Systems Operator, City of Gillette Water Division, Gillette, Wyoming. Personal communication with B. Strom, Planera, Inc., January 14, 2005.

National Oceanic and Atmospheric Administration (NOAA), 1969, Climatography of the United States: Asheville, North Carolina, National Climatic Center, Climatological Summaries, No. 20-48.

Naugle, D.E., C.L. Aldridge, B.L. Walker, T.E. Cornish, B.J. Moynihan, M.J. Holloran, K. Brown, G.D. Johnson, E.T. Schimidtman, R.T. Mayer, C.Y. Kato, M.R. Matchett, T.J. Christiansen, W.E. Cook, T. Creekmore, R.D. Falise, E.T. Rinkes, and M.S. Boyce, 2004, West Nile Virus: a pending crisis for greater sage-grouse. Ecology Letters, Vol. 7, p. 704-713.

Naugle, D.E., K.E. Doherty, and B.L. Walker, 2006, Sage-grouse Winter Habitat Selection and Energy Development in the Powder River Basin: Completion Report. Available from website on the Internet as of August 2006: <http://www.voiceofthewild.org/sagegrousestudies>.

Niering, W.A., 1985, Wetlands. Chanticlear Press, Inc., New York, New York. 638 pages.

Nyenhuis, James, 2005, Soil resource assessment of BLM Study Area, Maysdorf LBA Tract. Prepared for Cordero Mining Company.

Oedekoven, O.O., 1994, Distribution, habitat use, and population dynamics of the Rochelle Hills elk herd, Final Report, Wyoming Game and Fish Department, Gillette, Wyoming.

_____, 2001, Sage Grouse Job Completion Report, Sheridan Region, Wyoming Game and Fish Department.

_____, 2004, Data provided by Wyoming Game and Fish Department. Graph taken from Little Thunder LBA Record of Decision, USDA Forest Service, Douglas, Ranger District, Douglas, Wyoming.

Office of Surface Mining Reclamation and Enforcement (OSM), 1980, Noise impact assessment for the Caballo Rojo Mine. Unpublished Report prepared by James M. Montgomery, Consulting Engineers, Inc. Aurora, Colorado.

_____, 1984, Correlation and effect of mine facility wells on the Tullock Aquifer in the Gillette, Wyoming, vicinity. Prepared by G.E. McIntosh, C.A. Harrison and J.V. Wilcox.

Ogle, K.M., 2004, Spatial Examination of Backfill Aquifer Water Quality, Powder River Basin, Wyoming Using GIS. Paper presented at the 2004 Advanced Integration of Geospatial Technologies in Mining and Reclamation, December 7-9, 2004, Atlanta GA.

Ogle, K.M., M. Calle, G. Mooney, and D.N. Dornak, 2005, Cumulative Hydrological Impact Assessment (CHIA) of Coal Mining in the Middle Powder River Basin, Wyoming. Wyoming Department of Environmental Quality, Land Quality Division, WDEQ-CHIA-14.

Oil and Gas Journal, 2004, Wyoming, Regional Summary. Oil and Gas Journal, July 5, 2004, p 44.

Patton, T.M., 1997, Distribution and status of fishes in the Missouri River drainage in Wyoming: Implications for identifying conservation areas. PhD Dissertation, University of Wyoming, Laramie, Wyoming.

Pitchford, M.L. and W.C. Malm, 1994, Development and Applications of a Standard Visual Index, *in* Atmospheric Environment, 28(5): 1,049-54.

Powder River Eagle Studies, 1987-1999, Belle Ayr and Eagle Butte Mine's Annual Wildlife Monitoring Reports, submitted to WDEQ/LQD and on file in Sheridan and Cheyenne, Wyoming offices.

Rahn, P.H., 1976, Potential for Coal Strip-Mine Spoils as Aquifers in the Powder River Basin: Project Completion Report Prepared for Old West Regional Committee, Project No. 10470025.

Rapid City Journal, 2005, "Hurdles Remain for DM&E", by Dan Daly, Journal staff writer, December 6.

Rehm, B.W., G.H. Groenewold, and K.A. Morin, 1980, Hydraulic properties of coal and related materials. Northern Great Plains: Groundwater, v. 18, no. 6, pp 551-561.

ROMCOE, 1982, Center for Environmental Problem Solving, Rapid Growth Communities Project, Community Profiles. Boulder Colorado, July 1982.

Schneider, E.A., J. Johnston, and J. Lowe, 2000, Appendices D-2 and D-3A for the Buckskin Mine Expansion Permit. Report prepared for Triton Coal Company's Buckskin Mine by TRC Mariah Associates, Inc., Laramie, Wyoming.

Scire, J.S., D.S. Strimitis, and R.J. Yamartino, 1999a, A User's Guide for the CALPUFF Dispersion Model (Version 5.0). Earth Tech, Inc., Concord, Massachusetts. October 1999.

Scire, J.S., F.R. Robe, M.E. Fernau, and R.J. Yamartino, 1999b, A User's Guide for the CALMET Meteorological Model (Version 5.0). Earth Tech, Inc., Concord, Massachusetts. September 1999.

Shamley, Judy, 2005, WDEQ/AQD Senior Engineering Analyst, personal communication December 6.

______, 2006, WDEQ/AQD Senior Engineering Analyst, personal communication November 28.

Shelley, Kevin, 1992, Habitat Reclamation for Birds and Small Mammals on Surface Mined Lands in the Powder River Basin, Wyoming. M.S. Thesis Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming.

Sheridan Press, 2006, "Rails try to keep up with Wyoming coal production", AP, January 9.

______, 2007a, "Railroad's coal plans unclear after loan denial", Omaha, Nebraska AP, February 28.

______, 2007b, "Defeated in D.C., DM&E railroad looks to Wall Street for investors", Minneapolis, Minnesota AP, March 5.

Shorma, G., 2005, Personal communication between G. Shorma, Regional Supervisor, Wyoming Game and Fish Department, Sheridan, Wyoming, and B. Strom, ENSR, May 20, 2005.

Spencer, D.R., 2004, Personal communication between D.R. Spencer, Northeast Region Director, Wyoming Business Council and G. Blankenship, Blankenship Consulting, LLC, April and July, 2004.

Stratham, A., 2005, Personal communication between A. Stratham, Wyoming Game and Fish Department and B. Strom, ENSR, May 12, 2005.

Surface Transportation Board (STB), 2006, News release, "STB issues Final SEIS on Dakota, Minnesota & Eastern's PRB Expansion Project". Available from website on the Internet as of January 2006: <http://www.stb.dot.gov/>.

Thunder Basin Coal Company (TBCC), 2002, Black Thunder Mine Report for Development of Safe Setback Distances for Blasting Activities at the Black Thunder Mine, dated July 2002.

U.S. Army Corps of Engineers (COE), 1987, Corps of Engineers Wetlands Delineation Manual, by the Environmental Laboratory, Department of the Army, Waterways Experiment Station.

U.S. Census Bureau, 1990, General Population and Housing Characteristics: 1990. 1990 Summary Tape File (STF-1).

Available from website on the Internet as of December 2005: <http://factfinder.census.gov/>.

______, 2000, Housing-Physical Characteristics data from 2000 census. Campbell County and Gillette, Wyoming. Available from website on the Internet as of December 2005: <http://factfinder.census.gov/>.

______, 2001, 2000 Census of Population and Housing – Wyoming. Available from website on the Internet: <http://www.census.gov>.

______, 2005, Table 1: Annual Estimates of the Populations for Counties of Wyoming: April 1, 2000 to July 4, 2004 (SU-99-7). Available from website on the Internet: <http://www.census.gov>.

U.S. Department of Agriculture, Forest Service (USFS), 2006, Environmental Assessment – Yates Petroleum Corporation Marine Coal Bed Natural Gas Development Project. USDA-FS Douglas Ranger District, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Campbell County, Wyoming, June 2006. Available from website on the Internet as of July 2006: <http://www.fs.fed.us/r2/mbr/projects/mineral/adobepdf/YatesMarine_EA_Final.pdf>.

U.S. Department of Commerce (USDOC), 1990, Economics and Statistics Administration, Bureau of the Census, 1990 Census of Population and Housing.

______, 2000, Economics and Statistics Administration, Bureau of the Census, 2000 Census of Population and Housing.

U.S. Department of Energy (USDOE), 2005a, Energy Information Administration, "Emissions of Greenhouse Gases in the United States 2005". Available from website on the Internet as of January 2007: <http://www.eia.doe.gov/fuelcoal.html>.

______, 2005b, Energy Information Administration, "2005 Annual Report". Available from website on the Internet as of January 2007: <http://www.eia.doe.gov/fuelcoal.html>.

U.S. Environmental Protection Agency (EPA), 2001a, Region 8 comment letter to Nancy Doelger, BLM, on the North Jacobs Ranch Coal Lease Application DEIS, dated March 1. Reference to WMA Report "PRB Short-Term Exposure NO_2 Study", April 2000.

______, 2001b, Visibility in Mandatory Federal Class I Areas (1994-1998): A Report to Congress, Executive Summary, November 2001.

_____, 2003, Region 8 comment letter to Nancy Doelger, BLM, on the South Powder River Basin Coal DEIS dated April 16. Reference to air quality, nitrogen dioxide.

_____, 2005a, AirData Monitor Values Report – Criteria Air Pollutants (PM_{10}) and Nitrogen Dioxide (NO_2) for Campbell and Converse Counties, Wyoming. Available from website on the Internet as of April 2005: <http://oaspub.epa.gov/pls/airsdata/adaqs.monvals>.

_____, 2005b, PM_{10} Monitoring Stations in Wyoming, downloaded from website on the Internet as of March 2005: <http://www.epa.gov/air/data/geosel.html>.

_____, 2005c, Effects of Acid Rain: Lakes and Streams. Available from website on the Internet as of April 2005: <http://www.epa.gov/airmarkets/acidrain/effects/surfacewater.html>.

_____, 2006a, AirTrends. Available from website on the Internet as of July 2006: <http://www.epa.gov/air/airtrends>.

_____, 2006b, NO_x – How Nitrogen Oxides Affect the Way we Live and Breath. Available from website on the Internet as of July 2006: <http://www.epa.gov/air/urbanair/nox/index.html>.

_____, 2006c, Basic information about mercury. Available from website on the Internet as of April 21, 2006: <http://www.epa.gov/mercury/about.htm>.

_____, 2007, Clean Air Mercury Rule. Basic information available from website on the Internet as of January 2007: <http://www.epa.gov/air mercuryrule/basic.htm>.

U.S. Fish and Wildlife Service (USFWS), 2000a, 12-month administrative finding for a petition to list the black-tailed prairie dog from the National Wildlife Federation, dated July 30, 1998. Available from website on the Internet as of August 2000: <http://www.r6.fws.gov/btprairiedog>.

_____, 2000b, 12-month finding for a petition to list the black-tailed prairie dog as threatened. Federal Register 65(24): 5476 – 5488.

_____, 2001, Annual notice of findings on recycled petitions. Federal Register 66(5):1295 – 1300.

_____, 2002a, Memorandum from Mike Long, Field Supervisor, USFWS Wyoming Field Office, Cheyenne, Wyoming to BLM Casper Field Office Manager, Casper, Wyoming, dated June 7, 2002.

_____, 2002b, Coal Mine List of Migratory Bird Species of Management Concern in

Wyoming, based on Wyoming Bird Conservation Plan, Version 1.0, report available from Wyoming Field Office, Cheyenne, Wyoming.

______, 2003, Endangered and threatened wildlife and plants; withdrawal of the proposed rule to list the mountain plover as threatened. Federal Register 68(174): 53083 – 53101.

______, 2004, Letter from Brian Kelly, Field Supervisor, USFWS Wyoming Field Office, Cheyenne, Wyoming, to Kimberly Wolf, Cordero Rojo Mine, dated August 13, 2004.

______, 2005, Memorandum from Brian Kelly, Field Supervisor, USFWS Wyoming Field Office, Cheyenne, Wyoming, to James Murkin, BLM Field Office Manager, Casper Field Office, Casper, Wyoming, dated February 15, 2005.

U.S. Geological Survey (USGS), 2002, Assessment of Undiscovered Oil and Gas Resources of the Powder River Basin Province of Wyoming and Montana, 2002. U.S. Geological Survey National Oil and Gas Assessment Fact Sheet FS 146-02.

______, 2004, Quaternary Fault and Fold Database for the United States. Available from website on the Internet as of December 2004: <http://earthquake.usgs.gov/regional/states.php>.

______, 2005, Romeo Flores and Gary D. Stricker, authors. Unpublished data.

______, 2006, National Wildlife Health Center, Wildlife Health Bulletin 06-08, "West Nile Virus in Greater Sage-Grouse", November 6, 2006. Available from website on the Internet as of December 2006: <http://www.nwhc.usgs.gov/publications/wildlife_health_bulletins/WHB_06_08.jsp>.

Van Voast, W.A., and J.C. Reiten, 1988, Hydrogeologic response–twenty years of surface coal mining in southeastern Montana: Montana Bureau of Mines and Geology Memoir 62.

Van Voast, W.A., R.B. Hedges, and J.J. McDermott, 1978, Hydrologic Characteristics if Coal Mine Spoils, Southeastern Montana, Bureau of Mines and Geology, Bull. 102, 43pp.

Vonsik, Brenda, 2005, Campbell County Fire Department. Gillette, Wyoming. Personal communication with B. Strom, Planers, Inc. January 14, 2005.

Waters, T.F., 1995, Sediment in Streams, Sources, Biological Effects and Control. American Fisheries Society Monograph 7, 251 pp.

Westerman, J.W. and C. Prink, 2004, Soils Survey of Campbell County, Wyoming, Southern Part. USDA-Natural

Resources Conservation Service, in cooperation with USDI-Bureau of Land Management, USDA-Forest Service, and Wyoming Agricultural Experiment Station.

Western Regional Climate Center (WRCC), 2006, Historical climatological data for the Gillette 9ESE Station. Available from website on the Internet as of February 2006: <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wygill>.

Western Water Consultants (WWC), 1992, Modeling of Potential Drawdowns of the Coal and Overburden Aquifers at the Cordero Mine. Prepared for the Cordero Mine. Included in the WDEQ/LQD Cordero Mine Permit No. 237, Volume V, Addendum 2.6-10. July 31, 1992.

Winterfeld, G.F., 1978, Unpublished field notes, surveys of coal mines in Powder River Basin, Wyoming.

Wyoming Business Council, 2004, Wyoming 2004 Mineral and Energy Yearbook. Available from website on the Internet as of March 2005: <http://www.wyomingbusiness.org/pdf/energy/2004_yearbook.pdf>.

Wyoming Consensus Revenue Estimating Group (Wyoming CREG), 2006, Wyoming State Government Revenue Forecast, Fiscal Year 2007 – Fiscal Year 2012, October 2006. Available from website on the Internet as of December 2006: <http://eadiv.state.wy.us/creg/GreenCREG_Oct06.pdf>.

Wyoming Department of Administration and Information, 2004, Economic Analysis Division, Average Monthly Rental Rates for Apartments and Houses in Wyoming and Counties. Available from website on the Internet as of December 2004: <http://eadiv.state.wy.us/housing/>.

______, 2005, Economic Analysis Division, Wyoming population, cost of living, economic, and demographic data. Available from website on the Internet as of December 2005: <http://eadiv.state.wy.us>.

Wyoming Department of Employment, 1990, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 1990.

______, 1995, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 1995.

______, 1997, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 1997.

______, 1998, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 1998.

_____, 1999, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 1999.

_____, 2000, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 2000.

_____, 2001, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 2001.

_____, 2002, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 2002.

_____, 2003, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 2003.

_____, 2004, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 2004.

_____, 2005a, Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 2005.

_____, 2005b, Research and Planning Division. Table 65N: Employing Units, Employment, and Wages by NAICS Subsectors for Campbell County, Northeast Region-Fourth Quarter 2003. Available from website on the Internet as of December 2005: <http://doe.state.wy.us/lmi/03Q4_202/03q4t65.htm>.

_____, 2005c, Research and Planning Division. Wyoming Labor Force Trends, Vol. 42, No. 7. Available from website on the Internet as of December 2005: <http://doe.state.wy.us/lmi/0705/0705.pdf>.

_____, 2005d, Research and Planning Division, Wyoming Labor Force Trends, Vol. 42, No. 9. Available from website on the Internet as of September 2005: <http://doe.state.wy.us/lmi/0905/0905.pdf>.

Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD), 2000, Wyoming Air Quality Standards and Regulations.

_____, 2004, Letter from Dan Olson, AQD Administrator and John Corra, WDEQ Director, to Kimberley Wolf, CMC Environmental Engineer, approving Cordero Rojo Mine's modified dust control system, dated September 17, 2004.

_____, 2005a, Wyoming Visibility Monitoring Network. Available from website on the Internet as of February 2005: <http://www.wyvisnet.com/all.html>.

_____, 2005b, TSP data available from website on the Internet as of December, 2005: <http://deq.state.wy.us/aqd/downloads/AirMonitor>.

_____, 2005c, Powder River Basin coal mines, coal and overburden production, provided by Judy Shamley, Senior Engineering Analyst, Sheridan District Office, April 3, 2005.

______, 2005d, Wyoming's Long Term Strategy for Visibility Protection, Final 2003 Review Report, May 29, 2003. Available from website on the Internet as of April 2005: <http://deq.state.wy.us/aqd/prop/2003%20LTSReview.pdf>.

______, 2006, Natural Events Action Plan for the Coal Mines of the Powder River Basin of Campbell and Converse Counties, Wyoming. October 2006. Available from website on the Internet as of January 2007: <http://deq.state.wy.us/aqd/NEAP.asp>.

______, 2007, Personal communication (e-mail) from Kelly Bott (WDEQ/AQD) to Nancy Doelger (BLM), November 28.

Wyoming Department of Environmental Quality/Industrial Siting Division (WDEQ/ISD), 2007, Industrial Siting News: Basin Electric Awarded Permit. Available from website on the Internet as of March 2007: <http://deq.state.wy.us/isd/isdnews.htm>.

Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD), 1996, Cordero Mine State Decision Document, Permit No. 237-T5, Change No. 13, Amendment No. 1, Item No. 2(f), p.5. January 12, 1996. On file with WDEQ/LQD, Cheyenne and Sheridan, Wyoming.

______, 2002, Caballo Rojo Mine State Decision Document, Permit No. 511-T6, Permit Renewal, May 1, 2002. On file with WDEQ/LQD, Cheyenne and Sheridan, Wyoming.

______, 2004a, Cordero Mine State Decision Document, Permit No. 237-T7, Permit Renewal. September 16, 2004. On file with WDEQ/LQD, Cheyenne and Sheridan, Wyoming.

______, 2004b, Cumulative Hydrologic Impact Assessment of Coal Mining in the Middle Powder River Basin, Wyoming, CHIA-11, September 11, 2004.

Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD), 2005, Water Quality Rules and Regulations, Chapters 1 and 8 (Wyoming Surface Water and Groundwater Quality Standards, respectively). Available from website on the Internet as of December 2005: <http://deq.state.wy.us/wqd/WQDrules/>.

Wyoming Department of Revenue, 2004, Excise Tax Division, Sales and Use Tax Distribution Reports for Fiscal Year 2004. Available from website on the Internet as of March 2005:

<http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3&tabid=10>.

Wyoming Game and Fish Department (WGFD), 2003, Wyoming Greater Sage Grouse Conservation Plan, June 24, 2003. Available from website on the Internet: <http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse.asp>.

_____, 2004, Casper and Sheridan Region 2004 Annual Big Game Herd Unit Report.

_____, 2006, Press release July 14: "Wyomingites asked to submit dead sage grouse for West Nile testing".

Wyoming Mining Association (WMA), 2000, Air Quality Subcommittee, "Powder River Basin Short-Term Exposure NO_2 Study", April 2000.

_____, 2006, Wyoming Bentonite page from website on the Internet: <http://www.wma-minelife.com/bent/bentmine.htm>.

Wyoming Oil and Gas Conservation Commission (WOGCC), 2004, Wyoming Statistics. Available from website on the Internet: <http://WOGCC.state.wy.us/cfdocs/2002stats.html>.

_____, 2005a, Oil and gas well information downloaded from website on the Internet as of July 2005: <http://wogcc.state.wy.us>.

_____, 2005b, Rules and Statues. Available from website on the Internet as of March 2005: <http://wogcc.state.wy.us>.

_____, 2005c, Personal communication with W Berg, ENSR, regarding Application for Permit to Drill (APD) approvals, April 14, 2005.

_____, 2006, Coal bed natural gas well information downloaded from website on the Internet November 2006: <http://wogcc.state.wy.us>.

Wyoming School Facilities Commission (WSFC), 2005, Five Year Plan Information. Available from website on the Internet: <http://sfc.state.wy.us/DMPInfo.aspx>.

Wyoming Secretary of State (SOSWY), 2007, Wyoming Department of Environmental Quality/Land Quality Division Rules and Regulations, Chapter 4 (Environmental Protection Performance Standards for Surface Coal Mining Operations), Section 2(d)(xiv). Available from website on the Internet as of February 2, 2007: <http://soswy.state.wy.us/Rules/6002.pdf>.

Wyoming State Geological Survey (WSGS), 2002, Wyoming Geo-notes, No. 73, April 2002, 44 pp.

_____, 2003a, Wyoming Geo-notes, No. 76, April 2003, 36 pp.

______, 2003b, Wyoming Geo-Notes No. 78, November 2003, 47 pp.

______, 2004a, Wyoming Geo-notes, No. 81, November 2004, 38 pp.

______, 2004b, Digital Industrial Minerals and Construction Materials Map of Wyoming, by R.E. Harris. WSGS Map Series MS-47.

______, 2005a, Wyoming Geo-notes, No. 82, May 2005, 47 pp.

______, 2005b, Industrial Minerals and Uranium Section, Uranium Page. Available from website on the Internet as of November 2005: <http://www.wsgs.uwyo.edu/minerals/uranium.aspx>.

______, 2006, Wyoming Minerals Update: Coal. July to December, 2005, by Nick Jones. Available from website on the Internet as of November 2006: <http://www.wsgs.uwyo.edu/djvu/default.aspx>.

______, 2007, Wyoming Minerals Update: Coal. January to June, 2006, by Nick Jones. Available from website on the Internet as of February 2007: <http://www.wsgs.uwyo.edu/djvu/default.aspx>.

Wyoming BLM State Office-Reservoir Management Group (WSO-RMG), 2005a, Review of Coalbed Natural Gas and Conventional Oil and Gas Resources, Production, and Economics for the Maysdorf LBA Draft EIS, Powder River Basin, Wyoming.

______, 2005b, Personal communication with W. Berg and D. Dufresne, ENSR, March and April 2005.

7.0 GLOSSARY

aboriginal - Related to early or primitive cultures in a region.

ad valorum tax - A tax paid as a percentage of the assessed value of property.

adverse impact - An apparent direct or indirect detrimental effect.

aliquot - An exact portion.

alkalinity - The degree to which the pH of a substance is greater than 7.

alluvial deposit - Deposits of clay, silt, sand, gravel, and/or other materials carried by moving surface water, such as streams, and deposited at points of weak water flow; alluvium.

alluvial valley floor (AVF) - An area of unconsolidated stream-laid deposits holding streams with water availability sufficient for subirrigation or flood irrigation agricultural activities (see 30 CFR 701.5).

alluvium - Sorted or semi-sorted sediment consisting of clay, silt, sand, gravel, or other unconsolidated rock material deposited in comparatively recent geologic time by a stream or other body of running water in the bed of that stream or on its flood plain or delta.

alternative - In terms of the National Environmental Policy Act, one of several substitute or alternate proposals that a federal agency is considering in an environmental analysis.

ambient - Surrounding conditions (or environment) in a given place and time.

annual precipitation - The quantity of water that falls yearly in the form of rain, hail, sleet, and snow.

approximate original contour - Post-mining surface configuration achieved by backfilling and grading of mined-out areas so that the reclaimed land surface resembles the general surface configuration of the land prior to mining (see 30 CFR 701.5).

aquatic - Living or growing in or on the water.

aquifer - A layer of permeable rock, sand, or gravel that stores and transmits water in sufficient quantities for a specific use.

aquitard - A confining bed that retards but does not totally prevent the flow of water to or from an adjacent aquifer; a leaky confining bed.

area source – A plant site that does not emit any single HAP at a rate of 10 tons or greater per year, or any combination of HAPs at a rate of 25 tons or greater per year.

arithmetic mean - The sum of the values of n numbers divided by n. It is usually referred to as simply the "mean" or "average".

ash - The residual non-combustible matter in coal that comes from included silt, clay, silica, or other substances. The lower the ash content, the better the quality of the coal.

avian - Of, relating to, or derived from birds.

backfill - The operation of refilling an excavation. Also, the material placed in an excavation when it is refilled.

baseline - Conditions, including trends, existing in the human environment before a proposed action is begun; a benchmark state from which the environmental consequences of an action are forecast; the no-action alternative.

beneficial impact - An apparent direct or indirect advantageous effect.

bentonite - A clay formed by the decomposition of volcanic ash which has the ability to absorb large amounts of water and to expand to several times its normal volume; used in adhesives, cements and ceramic fillers.

bonus - That value in excess of the rentals and royalties that is paid to the United States as part of the consideration for receiving a lease for publicly owned minerals [see 43 CFR 3400.0-5(c)].

braided stream - A stream flowing in several dividing and reuniting channels resembling the strands of a braid.

buffer zone - An area between two different land uses that is intended to resist, absorb, or otherwise preclude development or intrusion between the two use areas.

bypass coal - An isolated part of a coal deposit that is not leased and that can only be economically mined in an environmentally sound manner as a part of continued mining by an existing adjacent operation [see 43 CFR 3400.0.5(d)].

clinker (scoria) - Baked and fused rock resulting from in-place burning of coal deposits.

coal bed natural gas (CBNG) - Natural gas (methane) that is generated during the coal-forming process.

colluvium - Rock fragments, sand, or soil material that accumulates at the base of slopes; slope wash.

confluence - The point at which two or more streams meet.

conglomerate - A rock that contains rounded rock fragments or pebbles cemented together by another mineral substance.

contiguous - Lands or legal subdivisions having a common boundary, lands having only a common corner are not contiguous.

cooperating agency - An agency which has jurisdiction by law in an action being analyzed in an environmental document and who is requested to participate in the NEPA process by the agency that is responsible for preparing the environmental document [see 40 CFR 1501.6 and 1508.5].

crucial wildlife habitat - Parts of the habitat necessary to sustain a wildlife population during periods of their life cycle. It may be a limiting factor on the population, such as nesting habitat or winter habitat.

cultural resources - The remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that reveal the nature of historic and prehistoric human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred, and (3) the environment immediately surrounding the resource.

cumulative impact - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

decibel - A unit of sound measurement. In general, a sound doubles in loudness for every increase of 10 decibels.

deciview (dv) - A general measure of view impairment (13 deciview equals a view of approximately 60 miles) caused by pollution. A 10 percent change in extinction corresponds to 1.0 dv.

dip - The angle at which a rock layer is inclined from the horizontal.

direct (or primary) impact - An impact caused by an action that occurs at the same time and place as the action (see 40 CFR 1508.8).

discharge - Any of the ways that ground water comes out of the surface, including through springs, creeks, or being pumped from a well.

dissected upland - An upland or high area in which a large part of the original surface has been deeply cut into by streams.

dragline - A type of excavating crane that casts a rope- or cable-hung bucket a considerable distance, collects the dug material by pulling the bucket toward itself on the ground with a second rope or cable, elevates the bucket, and dumps the material on a backfill bank or pile.

eolian deposit - Sediment carried, formed, or deposited by the wind, as sand dunes.

ephemeral stream - A stream that flows occasionally because of surface runoff, and is not influenced by permanent ground water.

erosion - The wearing away of the land surface by running water, wind, ice or other geologic agents.

evapotranspiration - The sum total of water lost from the land by evaporation and plant transpiration.

excavation (archeological) - The scientifically controlled recovery of subsurface materials and information from a cultural site. Recovery techniques are relevant to research problems and are designed to produce maximum knowledge about the site's use, its relation to other sites and the natural environment, and its significance in the maintenance of the cultural system.

exceedance (air quality) – Occurs when a particulate emissions compliance monitor at a facility records a 24-hour average reading in excess of the Ambient Air Quality Standards for particulate matter.

fair market value - The amount in cash, or in terms reasonably equivalent to cash, for which in all probability a coal deposit would be sold or leased by a knowledgeable owner willing but not obligated to sell or lease to a knowledgeable purchaser who desires but is not obligated to buy or lease.

fixed carbon - In coal, the solid combustible material remaining after removal of moisture, ash, and volatile matter. It is expressed as a percentage.

floodplain - The relatively flat area or lowland adjoining a body of flowing water, such as a river or stream, that is covered with water when the river or stream overflows its banks.

forage - Vegetation used for food by wildlife, particularly big game wildlife, and domestic livestock.

formation (geologic) - A rock body distinguishable from other rock bodies and useful for mapping or description. Formations may be combined into groups or subdivided into members.

fossil - The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust. Many minerals that may be of biologic origin are not considered to be fossils (e.g. oil, gas, asphalt, limestone).

geometric mean - The nth root of the product of the values of n positive numbers.

ground water - Subsurface water that fills available openings in rock or soil materials to the extent that they are considered water saturated.

habitat - A place where a plant or animal naturally or normally lives and grows.

habituation - The process of becoming accustomed to, or used to, something; acclimation.

hazardous materials - Substance which, because of its potential for corrosivity, toxicity, ignitability, chemical reactivity, or explosiveness, may cause injury to persons or damage to property.

hazardous waste - Those materials defined in Section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, and listed in 40 CFR § 261.

heterogenous - Made up of dissimilar constituents.

human environment - The natural and physical environment and the relationship of people with that environment (see 30 CFR 1508.14).

hydraulic conductivity - The capacity of a medium to transmit water; permeability coefficient. Expressed as the volume of water at the prevailing temperature that will move in unit time under a unit hydraulic gradient through a unit area. Units include gallons per day per square foot, centimeters per second.

hydraulic - Pertaining to fluid in motion, or to movement or action caused by water.

hydric soil - A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic (water-loving) vegetation. Hydric soils that occur in areas having positive indicators of hydrophytic vegetation and wetland hydrology are wetland soils.

hydrocarbon - Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

hydrogeology - The science that deals with subsurface waters and with related geologic aspects of surface waters.

hydrology - The science dealing with the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground.

hydrophytic vegetation - The plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. When hydrophytic vegetation comprises a community where indicators of hydric soils and wetland hydrology also occur, the area has wetland vegetation.

impermeable - Not capable of transmitting fluids or gasses in appreciable quantities.

incised - Having a margin that is deeply and sharply notched.

indirect (or secondary) impact - A reasonably foreseeable impact resulting from an action but occurring later in time than or removed in distance from that action (see 40 CFR 1508.8).

in-place coal reserves - The estimated volume of all of the coal reserves in a lease without considering economic or technological factors that might restrict mining.

in-situ leach mining - Removal of the valuable components of a mineral deposit through chemical leaching without physical extraction of the rock.

interbedded - Layers of one type of rock, typically thin, that are laid between or that alternate with layers of another type of rock.

interburden - A layer of sedimentary rock that separates two mineable coal beds.

interdisciplinary - Characterized by participation or cooperation among two or more disciplines or fields of study.

intermittent stream - A stream that does not flow year-round but has some association with ground water for surface or subsurface flow.

laminated - Consolidated or unconsolidated sediment that is characterized by thin (less than 1 cm thick) layers.

land and resource management plan (LRMP) - A land use plan that directs the use and allocation of U.S. Forest Service lands and resources.

lead agency - The agency or agencies preparing or having taken primary responsibility for preparing an environmental document (see 40 CFR 1508.16).

lease (mineral) - A legal document executed between a mineral owner or lessor and another party or lessee which grants the lessee the right to extract minerals from the tract of land for which the lease has been obtained [see 43 CFR 3400.0-5(r)].

lek - A traditional breeding area for grouse species where territorial males display and establish dominance.

lenticular - Term describing a body of rock or earth that thins out in all directions from the center like a double convex optical lens.

limb (geologic) - One side of a fold (syncline or anticline).

limestone - A sedimentary rock consisting chiefly of calcium carbonate.

lineament - A linear topographic feature of regional extent that is believed to reflect crustal structure.

loadout facilities - The mine facilities used to load the mined coal for transport out of the mine.

loam - A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

maintenance tract - A federal coal tract that would continue or extend the life of an existing coal mine.

major federal action - An action with effects that may be major and which is potentially subject to federal control and responsibility (see 40 CFR 1508.18).

major sources – Those sources that emit more than 10 tons per year of any single hazardous air pollutant, or 25 tons of all hazardous air pollutants combined. The determination of major is based on all sources of hazardous air pollutants at the site, and not just the equipment affected by the MACT standard.

maximum economic recovery (MER) - The requirement that, based on standard industry operating practices, all profitable portions of a leased federal coal deposit must be mined. MER determinations will consider existing proven technology; commercially available and economically feasible equipment; coal quality, quantity, and marketability; safety, exploration, operating, processing, and transportation costs; and compliance with applicable laws and regulations [see 43 CFR 3480.0-5(a)(24)].

meteorological - Related to the science dealing with the atmosphere and its phenomena, especially as relating to weather.

methane - A colorless, odorless, and inflammable gas; the simplest hydrocarbon; chemical formula = CH_4. It is the principal constituent of natural gas and is also found associated with crude oil and coal.

mineable coal - Coal that can be economically mined using present day mining technology.

mineral rights - The rights of one who owns the mineral estate (subsurface).

mining permit - A permit to conduct surface coal mining and reclamation operations issued by the state regulatory authority pursuant to a state program or by the Secretary pursuant to a federal program (see 30 CFR 701.5).

mitigation - An action to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

mudstone - A hardened sedimentary rock consisting of clay. It is similar to shale but lacks distinct layers.

National Register of Historic Places (NRHP) - A list of districts, sites, buildings, structures and objects significant in American history, architecture, archeology and culture maintained by the Secretary of the Interior. Expanded as authorized by Section 2(b) of the Historic Sites Act of 1935 (16 U.S.C. 462) and Section 101(a)(1) (A) of the National Historic Preservation Act.

natural gas - Combustible gases (such as hydrocarbons) or mixtures of combustible gases and non-combustible gases (such as helium) that are in a gaseous phase at atmospheric conditions of temperature and pressure.

NEPA process - All measures necessary for compliance with the National Environmental Policy Act of 1969 (see 40 CFR 1508.21).

No Action Alternative - An alternative where no activity would occur. The development of a no action alternative is required by regulations implementing the National Environmental Policy Act (40 CFR 1502.14). The No Action Alternative provides a baseline for estimating the effects of other alternatives.

outcrop - A rock formation that appears at or near the surface; the intersection of a rock formation with the surface.

overburden - Material of any nature, consolidated or unconsolidated, that overlies a coal or other useful mineral deposit, excluding topsoil.

paleontological resource - A site containing evidence of plant or non-human animal life of past geological periods, usually in the form of fossil remains.

peak discharge or flow - The highest discharge of water recorded over a specified period of time at a given stream location; also called maximum flow. Often thought of in terms of spring snowmelt, summer, fall or winter rainy season flows.

perennial species (vegetation) - Vegetation that lives over from season to season.

perennial stream - A stream or part of a stream that flows continuously during the calendar year as a result of groundwater discharge or surface runoff.

permeability - The ability of rock or soil to transmit a fluid.

permit application package - A proposal to conduct surface coal mining and reclamation operations on federal lands, including an application for a permit, permit revision, or permit renewal and all the information required by SMCRA, the applicable state program, any applicable cooperative agreement, and all other applicable laws and regulations including, with respect to federal leased coal, the Mineral Leasing Act and its implementing regulations.

permit area - The area of land, indicated on the approved map submitted by the operator with his or her application, required to be covered by the operator's performance bond under the regulations at 30 CFR Part 800 and which shall include the area of land upon which the operator proposes to conduct surface coal mining and reclamation operations under the permit, including all disturbed areas (see 30 CFR 701.5).

physiography - Physical geography.

piezometer - A well, generally of small diameter, that is used to measure the elevation of the water table.

playa - The sandy, salty, or mud-caked flat floor of a basin with interior drainage, usually occupied by a shallow ephemeral lake during or after rain or snow storms.

point source (pollution) - A point at which pollution is added to a system, either instantaneously or continuously. An example is a smokestack.

pore volume - The amount of fluid necessary to fill the void space in an unsaturated porus medium (i.e., mine backfill).

porosity - The percentage of the bulk volume of rock, sediment or soil that is not occupied by sediment or soil particles; the void space in rock or sediment. It may be isolated or connected.

postmining topography - The relief and contour of the land that remains after mining has been completed.

potentiometric surface - The surface that coincides with the static level of water in an aquifer. The surface is represented by the levels to which water from a given aquifer will rise under its full hydraulic head.

predator - An animal that obtains food by killing and consuming other animals.

prime or unique farmland - Those lands which are defined by the Secretary of Agriculture in 7 CFR part 657 (*Federal Register* Vol. 4 No. 21) and which have historically been used for cropland (see 30 CFR 701.5).

proposed action - In terms of National Environmental Policy Act, the project, activity, or action that a federal agency proposes to implement or undertake and which is the subject of an environmental analysis.

qualified surface owner - The natural person or persons (or corporation, the majority stock of which is held by a person or persons otherwise meeting the requirements of this section) who:

(1) Hold legal or equitable title to the surface of split estate lands;
(2) Have their principal place of residence on the land, or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations; or received directly a significant portion of their income, if any, from such farming and ranching operations; and
(3) have met the conditions of (1) and (2) above for a period of at least three years, except for persons who gave written consent less than three years after they met the requirements of both (1) and (2) above [see 43 CFR 3400.0-5(gg)].

raptor - Bird of prey, such as an eagle, falcon, hawk, owl, or vulture.

recharge - The processes by which groundwater is absorbed into a zone of saturation.

reclamation - Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore the disturbed area for post-mining use.

record of decision (ROD) - A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action (see 40 CFR 1505.2).

recoverable coal - The amount of coal that can actually be recovered for sale from the demonstrated coal reserve base.

rental payment - Annual payment from a lessee to a lessor to maintain the lessee's mineral lease rights.

resource management plan (RMP) - A land use plan, as prescribed by FLPMA, that directs the use and allocation of public lands and resources managed by BLM. Prior to selection of the RMP, different alternative management plans are compared and evaluated in an environmental impact statement (EIS) to determine which plan will best direct the management of the public lands and resources.

revegetation - The reestablishment and development of self-sustaining plant cover following land disturbance. This may occur through natural processes, or the natural processes may be enhanced by human assistance through seedbed preparation, reseeding, and mulching.

right of way (ROW) - The right to pass over property owned by another. The strip of land over which facilities such as roadways, railroads, or power lines are built.

riparian - The area adjacent to rivers and streams that lies between the stream channel and upland terrain and that supports specific vegetation influenced by perennial and/or intermittent water.

royalty (mineral) - A share of production that is free of the expense of production. It is generally paid by a lessee to a lessor of a mineral lease as part of the terms of the lease.

runoff - That portion of rainfall that is not absorbed; it may be used by vegetation, lost by evaporation, or it may find its way into streams as surface flow.

salinity - Refers to the solids, such as sodium chloride (table salt) and alkali metals, that are dissolved in water. Often in non-saltwater areas, total dissolved solids is used as an equivalent term.

sandstone - A common sedimentary rock primarily composed of sand grains, mainly quartz, that are cemented together by other mineral material.

scoping - A public informational process required by the National Environmental Policy Act to determine private and public concerns, scope of issues, and/or questions regarding a proposed action to be evaluated in an environmental impact analysis.

scoria (clinker) - Baked and fused rock resulting from in-place burning of coal deposits.

sedimentation pond - An impoundment used to remove solids from water in order to meet water quality standards or effluent limitations before the water leaves the permit area (see 30 CFR 701.5).

semi-arid - A climate or region characterized by little yearly rainfall and by the growth of a number of short grasses and shrubs.

severance tax - A tax on the removal of minerals from the ground.

shale - A very fine-grained clastic rock or sediment consisting predominately of clay-sized particles that is laminated; lithified, layered mud.

significant impact - A qualitative term used to describe the anticipated importance of impacts to the human environment as a result of an action.

siltstone - A fine-grained clastic rock consisting predominately of silt-sized particles.

socioeconomics - The social and economic situation that might be affected by a proposed action.

soil survey - The systematic examination, description, classification, and mapping of soils in an area, usually a county. Soil surveys are classified according to the level of detail of field examination. Order I is the most detailed and Order V is the least detailed.

spontaneous combustion - The heating and slow combustion of coal and coaly material initiated by the absorption of oxygen.

stipulations - Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to specific leases at the discretion of the surface management agency to protect valuable surface resources or uses existing on those leases.

storage coefficient - The volume of water that can be released from storage per unit surface area of a saturated confined aquifer, per unit decline in the component of hydraulic head normal to the surface. It is calculated by taking the product of the specific storage and the aquifer thickness.

stratigraphic - Of, relating to, or determined by stratigraphy, which is the branch of geology dealing with the study of the nature, distribution, and relations of layered rocks in the earth's crust.

stripping ratio - The unit amount of overburden that must be removed to gain access to a similar unit amount of coal.

subirrigation - In alluvial valley floors, the supplying of water to plants from underneath, or from a semi-saturated or saturated subsurface zone where water is available for use by vegetation (see 30 CFR 701.5).

subbituminous - A lower rank of coal (35-45 percent carbon) with a heating value between that of bituminous and lignite, usually 8,300-11,500 Btu per pound. Subbituminous coal contains a high percentage of volatile matter and moisture.

surface disturbance - Any disturbance by mechanical actions that alters the soil surface.

surface rights - Rights to the surface of the land, does not include rights to oil, gas, or other subsurface minerals or subsurface rights.

suspended solids - The very fine soil particles that remain in suspension in water for a considerable period of time without contact with the stream or river channel bottom.

tectonic fracture - Fractures caused by deformation of the earth's crust.

threatened and endangered (T&E) species - These species of plants or animals classified as threatened or endangered pursuant to Section 4 of the Endangered Species Act. Any species which is in danger of extinction, or is likely to become so within the foreseeable future.

Category 1 - Substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened.

Category 2 - Current information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial biological information is not on file to support an immediate ruling (U.S. Fish and Wildlife Service).

topography - Physical shape of the ground surface; the configuration of land surface including its relief, elevation, and the position of its natural and manmade features.

topsoil - The surface layer of a soil.

total dissolved solids (TDS) - The total quantity in milligrams per liter of dissolved materials in water.

transmissivity - The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Equals the hydraulic conductivity multiplied by the aquifer thickness. Values are given in units of gallons per day per foot.

transpiration - The discharge of water vapor by plants.

truck & shovel - A mining method used to remove overburden and coal in a strip mining operation. Truck and shovel operations use large bucket-equipped digging and loading machines (shovels) and large dump trucks to remove overburden instead of using a dragline for overburden removal.

typic - Typical.

unconfined aquifer - An aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.

unsuitability criteria - The 20 criteria described in 43 CFR 3461, the application of which results in an assessment of federal coal lands as suitable or unsuitable for surface coal mining.

uranium - A very hard, heavy, metallic element that is crucial to development of atomic energy.

vegetation type - A kind of existing plant community with distinguishable characteristics described in terms of the present vegetation that dominates an area.

vertebrate fossils - The remains of animals that possessed a backbone; examples are fish, amphibians, reptiles, dinosaurs, birds, and mammals.

vesicular - Rock containing many small cavities that were formed by the expansion of a bubble of gas or steam during the solidification of the rock.

violation (air quality) – A formal notice to a facility that it has not met the Ambient Air Quality Standards, as determined by EPA formula, which is based on particulate emissions compliance monitor reading frequency. Annual standards are not to be exceeded and short-term standards are not to be exceeded more than once per year on average over a three-year period. Violations are issued at regulatory agency discretion and may be based on extenuating circumstances.

visual resources - The physical features of a landscape that can be seen (e.g., land, water, vegetation, structures, and other features).

Visual Resource Management (VRM) - The systematic means to identify visual values, establish objectives which provide the standards for managing those values, and evaluate the visual impacts of proposed projects to ensure that objectives are met.

volatile matter - In coal, those substances, other than moisture, that are given off as gas or vapor during combustion.

waterfowl - A bird that frequents water, especially a swimming bird.

wetlands - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs [see 33 CFR 328.3(a)(7)(b)].

wild and scenic river - Rivers or sections of rivers designated by Congressional actions under the 1968 Wild and Scenic Rivers Act as wild, scenic, or recreational by an act of the Legislature of the state or states through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

> **wild river areas** - Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
>
> **scenic river areas** - Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
>
> **recreational river areas** - Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

wilderness - An area of undeveloped Federal land designated wilderness by Congress, retaining its primeval character and influence, without permanent improvements or human habitation, protected and managed to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable, (2) has outstanding opportunities for solitude or primitive and unconfined recreation, (3) has at least 5,000 acres or is of sufficient size to make practical its preservation and use in an unimpaired condition, and (4) also may contain features that are of ecological, geological, scientific, educational, scenic, or historical value. These characteristics were identified by Congress in the Wilderness Act of 1964.

8.0 INDEX

agriculture ES-13, 2-11, 2-30, 2-36, 3-78, 3-84, 3-85, 3-86, 4-53, 4-68, 4-69, 4-70, 5-7, 6-1, 6-13, 7-10, E-27, E-32

alluvial valley floor or AVF ES-8, ES-11, ES-13, ES-16, 1-6, 2-11, 2-12, 2-30, 2-36, 3-1, 3-84, 3-85, 3-86, 4-4, 4-53, 4-54, 5-5, 6-1, 6-13, B-3

Belle Fourche River ES-11, ES-13, 1-16, 2-7, 3-6, 3-7, 3-10, 3-19, 3-61, 3-62, 3-74, 3-75, 3-77, 3-78, 3-79, 3-80, 3-84, 3-85, 3-87, 3-88, 3-94, 3-98, 3-99, 3-101, 3-115, 3-116, 3-117, 3-118, 3-119, 3-120, 3-128, 4-25, 4-52, 4-53, 4-55, 4-63, 4-65, 4-67, 4-73, 4-74, E-12, E-13, E-15, E-21, E-22

blasting... ES-9, 1-16, 2-7, 2-11, 3-27, 3-28, 3-41, 3-45, 3-47, 3-48, 3-49, 3-50, 3-51, 3-52, 3-53, 3-54, 3-58, 3-60, 3-140, 3-142, 4-48

bonus payment or bonus bid payment .... ES-6, ES-15, ES-16, 1-10, 2-28, 3-148, 3-149, 3-151, Appendix H

coal bed natural gas or CBNG ES-7, ES-8, ES-9, ES-14, ES-20, 1-14, 1-16, 2-3, 2-24, 2-26, 2-29, 2-36, 2-37, 3-12, 3-13, 3-14, 3-15, 3-16, 3-17, 3-28, 3-32, 3-46, 3-63, 3-65, 3-66, 3-67, 3-69, 3-70, 3-74, 3-77, 3-78, 3-80, 3-81, 3-82, 3-86, 3-87, 3-88, 3-99, 3-115, 3-116, 3-117, 3-123, 3-125, 3-126, 3-127, 3-128, 3-129, 3-138, 3-140, 3-154, 3-160, 3-162, 3-163, 4-1, 4-14, 4-16, 4-17, 4-18, 4-19, 4-20, 4-21, 4-27, 4-28, 4-29, 4-30, 4-38, 4-41, 4-42, 4-43, 4-47, 4-49, 4-50, 4-51, 4-52, 4-53, 4-54, 4-55, 4-57, 4-58, 4-59, 4-61, 4-62, 4-63, 4-64, 4-65, 4-67, 4-71, 4-76, 4-78, 4-79, 4-81, 4-83, 4-88, 4-90, 4-91, 4-93, 4-95, 5-4, 6-13, 6-19, 7-2, E-13

fair market value .... ES-1, ES-4, 1-3, 1-4, 1-16, 2-5, 2-22, 2-25, 3-129, 5-2, 7-4, Appendix H fugitive dust .... ES-9, 3-26, 3-28, 3-37, 3-41, 3-44, 4-31, 4-75, Appendix H

grazing .... ES-14, 1-9, 2-12, 2-13, 2-31, 2-32, 3-95, 3-97, 3-123, 3-129, 3-130, 3-131, 3-133, 3-160, 4-68, 4-69, 4-70, 5-5, E-21, Appendix H

hunting ES-15, 3-126, 3-127, 3-128, 3-130, 3-131, 3-162, 4-68, 4-70, 4-71, 4-72, 6-5, 6-7, E-17

migratory birds 2-32, 3-1, 3-109, 3-113, 3-114, 3-119, 3-120, E-11

mitigation .... ES-15, 3-12, 2-9, 2-10, 2-11, 2-12, 2-13, 2-14, 4-30, 4-34, 4-40, 4-50, 4-57, 4-74, 6-4, 7-8, D-2, E-11, E-12, E-22, E-26, E-27, E-29, Appendix H

MLA mining plan 1-3, 1-11, 1-12, 2-26, A-1, E-26

monitoring plan(s) 2-9, 2-10, 2-11, 2-12, 2-13, 2-14

nitrogen oxide or NO_2 .... ES-9, ES-18, 1-16, 2-11, 2-35, 4-32, 4-33, 4-34, 4-35, 4-36, 4-38, 4-40, 6-9, 6-13, 6-14, 6-19

noxious weeds 3-94 3-96, 3-97, 4-56, 4-57, 4-61, 4-66

PM_{10} .... ES-9, ES-18, 2-10, 2-24, 2-34, 2-35, 4-32, 4-33, 4-34, 4-35, 4-36, 4-38, 4-40, 6-14, Appendix H

power plant(s) 1-10, 2-25, 4-8, 4-12, 4-13, 4-14, 4-15, 4-17, 4-21, 4-28, 4-30, 4-31, 4-38, 4-40, 4-48, 4-56, 4-57, 4-58, 4-67, 4-75, 4-76, 4-79, 7-80, 4-86, 4-92, 4-93, 4-94, E-27, E-28

reclamation bond .... ES-13, 2-12, 2-27, Appendix H

recreation ES-8, ES-16, 2-32, 2-38, 4-51, 4-52, 4-68, 4-70, 4-71, 7-15, B-1

royalty .... ES-6, ES-15, 1-3, 1-10, 2-13, 2-24, 2-25, 2-26, 2-28, 4-91, 7-11, D-4, Appendix H sage grouse ES-15, 2-32, 6-1, 6-10, 6-19, B-3, E-12, E-30

T&E species ES-16, 7-13, E-1, E-6, E-11, E-13, E-14, E-16, E-25, E-27, E-29, E-30

total dissolved solids or TDS........ ES-11, 2-30, 3-62, 3-64, 3-65, 3-66, 3-72, 3-73, 3-78, 3-79, 4-49, 4-53, 4-64, 7-11, 7-13

total suspended solids or TSS........ 3-79, 4-64

U.S. Forest Service or USDA-FS........ 3-60, 3-104, 3-111, 4-56, 4-65, 4-69, 5-1, 7-6, B-3, E-23, E-32

U.S. Environmental Protection Agency or EPA........ 1-16, 1-17, 2-10, 2-15, 3-20, 3-21, 3-22, 3-25, 3-27, 3-29, 3-31, 3-33, 3-40, 3-46, 3-47, 3-48, 3-49, 3-55, 3-56, 3-59, 3-60, 3-161, 3-162, 4-31, 4-33, 4-34, 4-74, 5-1, 5-2, 5-7, 6-13, 7-14, Appendix H

U.S. Fish and Wildlife Service or USFWS........ 1-15, 2-32, 3-87, 3-88, 3-98, 3-103, 3-107, 3-108, 3-109, 3-113, 3-114, 3-115, 3-119, 3-121, 4-65, 5-1, 6-14, 6-15, 7-13, B-2, D-3, E-10, E-12, E-13, E-15, E-16, E-17, E-20, E-21, E-22, E-23, E-24, E-30, E-31, E-32, E-33, Appendix H

wetland(s)........ ES-7, ES-13, ES-16, 1-16, 2-11, 2-12, 2-30, 2-37, 3-1, 3-86, 3-87, 3-88, 3-89, 3-90, 3-96, 3-97, 3-116, 3-119, 4-55, 4-58, 4-61, 4-68, 4-69, 5-5, 6-10, 6-12, 7-5, 7-6, 7-15, A-1, E-12, E-15, E-16, E-20, E-21, E-22, E-30, Appendix H

Wyoming Department of Environmental Quality or WDEQ.. ES-4, ES-9, ES-11, ES-13, ES-20, 1-3, 1-4, 1-11, 1-12, 2-6, 2-11, 2-15, 2-16, 2-24, 2-26, 2-30, 3-2, 3-7, 3-8, 3-17, 3-20, 3-21, 3-22, 3-25, 3-26, 3-27, 3-29, 3-31, 3-33, 3-35, 3-37, 3-40, 3-43, 3-44, 3-45, 3-46, 3-47, 3-48, 3-49, 3-50, 3-52, 3-53, 3-54, 3-55, 3-56, 3-58, 3-59, 3-61, 3-64, 3-66, 3-70, 3-73, 3-74, 3-78, 3-80, 3-81, 3-83, 3-84, 3-85, 3-86, 3-88, 3-89, 3-90, 3-92, 3-95, 3-96, 3-97, 3-98, 3-99, 3-102, 3-107, 3-114, 3-117, 3-118, 3-130, 3-147, 4-6, 4-14, 4-31, 4-34, 4-40, 4-41, 4-42, 4-43, 4-44, 4-47, 4-49, 4-53, 4-55, 4-57, 4-58, 5-3, 5-4, 6-4, 6-5, 6-6, 6-7, 6-9, 6-10, 6-12, 6-16, 6-17, 6-18, 6-19, E-1, E-12, E-13, E-22, E-25, E-26, E-29, E-30, E-31, F-1, Appendix H

APPENDIX A

FEDERAL AND STATE PERMITTING REQUIREMENTS AND AGENCIES

APPENDIX A:
FEDERAL AND STATE AGENCIES & PERMITTING REQUIREMENTS

Agency	Lease/Permit/Action
FEDERAL	
Bureau of Land Management	Coal Lease Resource Recovery & Protection Plan Scoria Sales Contract Exploration Drilling Permit
Office of Surface Mining Reclamation and Enforcement	Preparation of MLA Mining Plan Approval Document SMCRA Oversight
Office of the Secretary of the Interior	Approval of MLA Mining Plan
Mine Safety and Health Administration	Safety Permit and Legal ID Ground Control Plan Major Impoundments Explosives Use and Storage Permit
Bureau of Alcohol, Tobacco, and Firearms	Explosive's Manufacturer's License Explosives Use and Storage Permit
Federal Communication Commission	Radio Permit: Ambulance Mobile Relay System Radio License
Nuclear Regulatory Commission	Radioactive By-Products Material License
Army Corps of Engineers	Authorization of Impacts to Wetlands and Other Waters of the U.S.
Department of Transportation	Hazardous Waste Shipment Notification
Federal Aviation Administration	Radio Tower Permits
STATE	
State Land Commission	Coal Lease Scoria Lease
Department of Environmental Quality-Land Quality Division	Permit and License to Mine
Department of Environmental Quality-Air Quality Division	Air Quality Permit to Operate Air Quality Permit to Construct
Department of Environmental Quality-Water Quality Division	National Pollutant Discharge Elimination System Water Discharge Permit Permit to Construct Sedimentation Pond Authorization to Construct Septic Tank & Leach Field Authorization to Construct and Install a Public Water Supply and Sewage Treatment System
Department of Environmental Quality-Solid Waste Management Program	Solid Waste Disposal Permit-Permanent and Construction
State Engineer's Office	Appropriation of Surface Water Permits Appropriation of Ground Water Permits
Industrial Siting Council	Industrial Siting Certificate of Non-Jurisdiction
Department of Health	Radioactive Material Certificate of Registration

APPENDIX B

UNSUITABILITY CRITERIA
FOR THE MAYSDORF LBA TRACT

APPENDIX B. UNSUITABILITY CRITERIA FOR THE MAYSDORF LBA TRACT

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR MAYSDORF LBA TRACT
1. **Federal Land Systems.** With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands acquired through the Land and Water Conservation Fund, National Forests and Federal lands in incorporated cities, towns and villages.	There are Federal lands located around Gillette, Sheridan, and Wright which were determined to be unsuitable under this criterion.	None of the federal lands determined to be unsuitable under Criterion 1 are present on the Maysdorf LBA Tract. Therefore, there are no unsuitable findings under Criterion 1 for the Maysdorf LBA Tract.
2. **Rights-Of-Way and Easements.** Federal lands that are within ROWs or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	Portions of the BNSF & UP railroad ROWs, the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the 1-90 ROW were found to be unsuitable under this criterion within the general review area.	The portions of the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, the 1-90 ROW, and the BNSF & UP railroad ROW that were determined to be unsuitable are not located on the Maysdorf LBA Tract. Therefore, there area no unsuitable findings under Criterion 2 for the Maysdorf LBA Tract.
3. **Buffer Zones for Rights-Of-Way, Communities, and Buildings.** Federal lands within 100 ft of a ROW of a public road or a cemetery; or within 300 ft of any public building, school, church, community or institutional building or public park; or within 300 ft of an occupied dwelling are unsuitable for mining.	Portions of Wyoming State Highway 450, interstate Highway 1-90, and one cemetery were found to be unsuitable under this criterion. Decisions were deferred on other highways/roads, occupied dwellings, and one school.	Highway 450, I-90, and the cemetery are not located on the Maysdorf LBA Tract. No occupied dwellings, other highways/roads, or schools are located on the tract. Therefore, there are no unsuitable findings under Criterion 3 for the Maysdorf LBA Tract.
4. **Wilderness Study Areas.** Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	There are no unsuitable findings under Criterion 4 for the Maysdorf LBA Tract.
5. **Scenic Areas.** Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in the general review area meet the scenic criteria as outlined.	There are no unsuitable findings under Criterion 5 for the Maysdorf LBA Tract.
6. **Land Used for Scientific Study.** Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	Two vegetation monitoring study sites on the TBNG (NE¼ of Sec. 1, T.41N., R.71W. and NW¼ NW ¼ of Sec. 30, T.41N., R.69W.), and the Hoe Creek Site (Sec. 7, T.47N., R.72W.) were found to be unsuitable under this criterion.	The vegetation monitoring sites and the Hoe Creek site are not located on the Maysdorf LBA Tract. There are no unsuitable findings under Criterion 6 for the Maysdorf LBA Tract.
7. **Cultural Resources.** All publicly or privately owned places which are included in or are eligible for inclusion in the NRHP and an appropriate buffer zone are unsuitable.	On the basis of the consultation with SHPO, there were no unsuitable findings under this criterion in the general review area. Continue using the "Standard Archeological Stipulation" to new leases.	There are no unsuitable findings under Criterion 7 for the Maysdorf LBA Tract. The "Standard Archeological Stipulation" should be applied if this tract is leased.

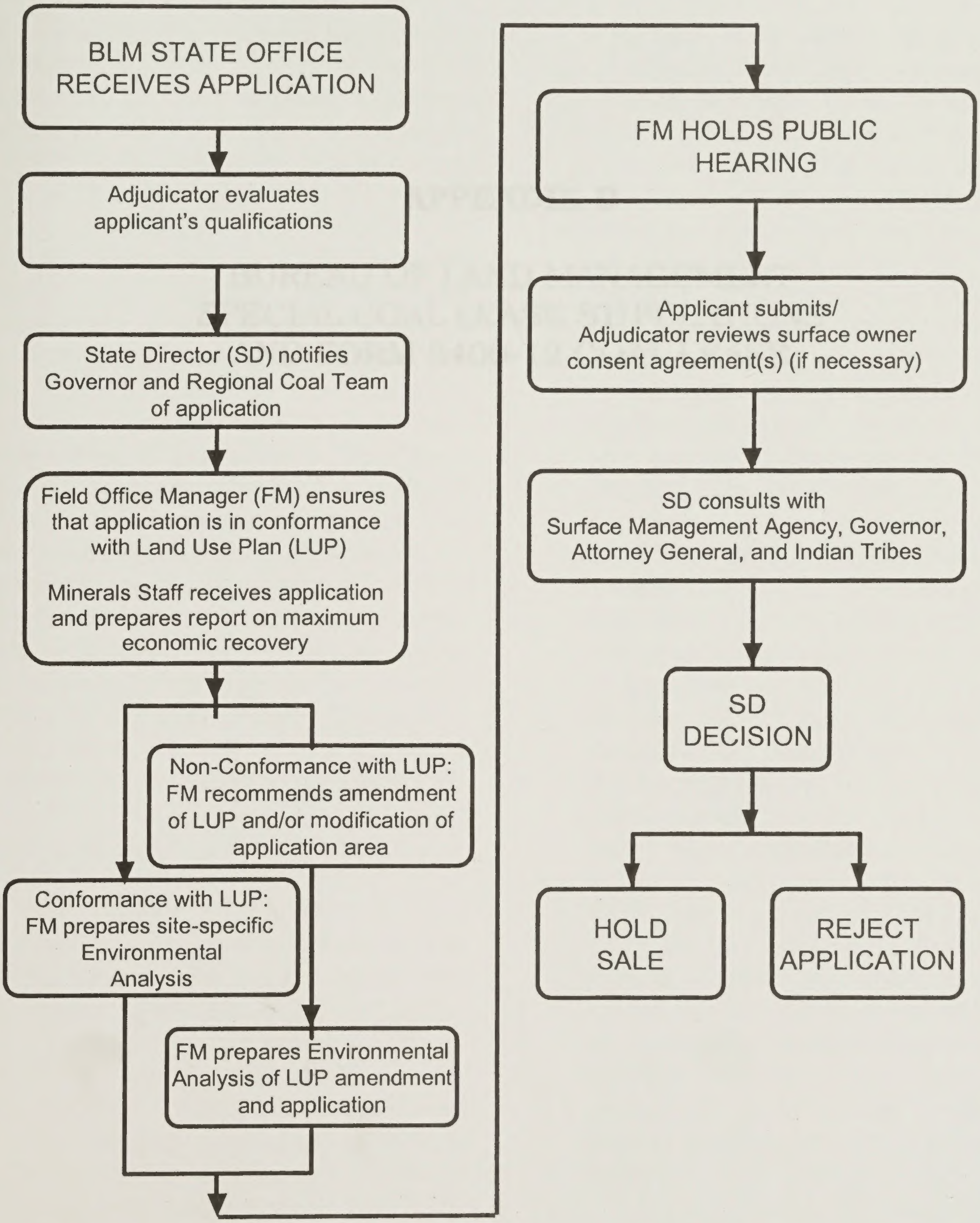
UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR MAYDORF LBA TRACT
8. **Natural Areas.** Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings under Criterion 8 for the Maysdorf LBA Tract.
9. **Critical Habitat for Threatened or Endangered Plant and Animal Species.** Federally designated critical habitat for threatened or endangered plant and animal species, and scientifically documented essential habitat for threatened or endangered species are unsuitable.	There is no federally designated critical habitat for threatened or endangered plant or animal species within the general review area.	There are no unsuitable findings under Criterion 9 for the Maysdorf LBA Tract.
10. **State Listed Threatened or Endangered Species.** Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as threatened or endangered shall be considered unsuitable.	Wyoming does not maintain a state list of threatened or endangered species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings under Criterion 10 for the Maysdorf LBA Tract.
11. **Bald or Golden Eagle Nests.** An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	Defer suitability decisions and evaluate bald and golden eagle nests on a case by case basis at the time of leasing. Establish buffer zones around nests during mining and reclamation planning after consultation with USFWS.	There are currently no bald eagle nests and inactive golden eagle nests on the Maysdorf LBA Tract. Evaluate suitability prior to lease issuance during consultation with USFWS.
12. **Bald and Golden Eagle Roost and Concentration Areas.** Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	Defer suitability decisions and evaluate bald and golden eagle roost areas on a case by case basis prior to lease issuance. Establish buffer zones after consultation with USFWS.	There are no identified roost sites on the Maysdorf LBA Tract. Evaluate suitability prior to lease issuance during consultation with USFWS.
13. **Falcon Nesting Sites and Buffer Zones.** Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	Defer suitability decisions on falcon nesting sites and evaluate on a case by case basis prior to lease issuance. Establish buffer zones around nesting sites after consultation with USFWS.	No falcon nesting sites have been identified on the Maysdorf LBA Tract. There are no unsuitable findings under Criterion 13 for the Maysdorf LBA Tract.
14. **Habitat for Migratory Bird Species.** Federal lands which are high priority habitat for migratory bird species of management concern in Wyoming shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	Defer suitability decisions on high priority habitat for migratory bird species of management concern in Wyoming and evaluate on a case by case basis prior to lease issuance. Establish buffer zones for nesting areas during mining and reclamation planning after consultation with USFWS.	Evaluate suitability during consultation with USFWS.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR MAYSDORF LBA TRACT
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish, wildlife and plant habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable unless mining can be conducted in such a way as to ensure no long-term impact on the species being provided will occur.	Defer suitability decisions on grouse leks and evaluate on a case by case basis prior to lease issuance. Establish buffer zones after consultation with WGFD.	There are no active or inactive sage grouse leks on the Maysdorf LBA Tract. There are currently three active sage grouse leks identified on lands adjacent to the LBA tract: one within ¼m ile; one within ¾ mile; and one just over one mile of the Maysdorf LBA Tract. Evaluate this criterion prior to lease issuance. Establish buffer zones during mining and reclamation planning after consultation with WGFD.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	The BLM and USDA-FS have determined that the identified floodplains in the general review area could potentially be mined. Therefore, all lands within the general review area are considered suitable.	Site-specific stipulations and resource protection safeguards will be applied if necessary during mining and reclamation planning. There are no unsuitable findings under Criterion 16 for the Maysdorf LBA Tract.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no designated municipal watersheds in the general review area.	There are no unsuitable findings under Criterion 17 for the Maysdorf LBA Tract.
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and 1/4-mile buffer zones shall be unsuitable.	There are no designated national resource waters within the general review area.	There are no unsuitable findings under Criterion 18 for the Maysdorf LBA Tract.
19. Alluvial Valley Floors. Federal lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Consider areas determined to contain AVFs significant to farming as unsuitable. Defer decisions on other AVFs and analyze on a case-by-case basis prior to lease issuance.	No potential AVFs have been identified on the Maysdorf LBA Tract with characteristics indicating potential significance to farming. There are no unsuitable findings under Criterion 19 for the Maysdorf LBA Tract.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	There are no criterion proposed by state or Indian tribes that have been approved by the Secretary of the Interior. No tribal lands are located in or near the general review area.	There are no unsuitability findings for this criterion on the Maysdorf LBA Tract.

APPENDIX C

COAL LEASE-BY-APPLICATION FLOW CHART

COAL LEASE-BY-APPLICATION


BLM STATE OFFICE RECEIVES APPLICATION
Adjudicator evaluates applicant's qualifications
State Director (SD) notifies Governor and Regional Coal Team of application
Field Office Manager (FM) ensures that application is in conformance with Land Use Plan (LUP)
Minerals Staff receives application and prepares report on maximum economic recovery
Non-Conformance with LUP: FM recommends amendment of LUP and/or modification of application area
Conformance with LUP: FM prepares site-specific Environmental Analysis
FM prepares Environmental Analysis of LUP amendment and application
FM HOLDS PUBLIC HEARING
Applicant submits/ Adjudicator reviews surface owner consent agreement(s) (if necessary)
SD consults with Surface Management Agency, Governor, Attorney General, and Indian Tribes
SD DECISION
HOLD SALE
REJECT APPLICATION

APPENDIX D

BUREAU OF LAND MANAGEMENT SPECIAL COAL LEASE STIPULATIONS AND FORM 3400-12 COAL LEASE

BLM will attach the following special stipulations to the Maysdorf LBA Tract if it is leased:

SPECIAL STIPULATIONS

In addition to observing the general obligations and standards of performance set out in the current regulations, the lessee shall comply with and be bound by the following special stipulations.

These stipulations are also imposed upon the lessee's agents and employees. The failure or refusal of any of these persons to comply with these stipulations shall be deemed a failure of the lessee to comply with the terms of the lease. The lessee shall require his agents, contractors and subcontractors involved in activities concerning this lease to include these stipulations in the contracts between and among them. These stipulations may be revised or amended, in writing, by the mutual consent of the lessor and the lessee at any time to adjust to changed conditions or to correct an oversight.

(a) ***CULTURAL RESOURCES***

(1) Before undertaking any activities that may disturb the surface of the leased lands, the lessee shall conduct a cultural resource intensive field inventory in a manner specified by the Authorized Officer of the BLM or of the surface managing agency, if different, on portions of the mine plan area and adjacent areas, or exploration plan area, that may be adversely affected by lease-related activities and which were not previously inventoried at such a level of intensity. The inventory shall be conducted by a qualified professional cultural resource specialist (i.e., archeologist, historian, historical architect, as appropriate), approved by the Authorized Officer of the surface managing agency (BLM, if the surface is privately owned), and a report of the inventory and recommendations for protecting any cultural resources identified shall be submitted to the Regional Director of the Western Region of the Office of Surface Mining (the Western Regional Director), the Authorized Officer of the BLM, if activities are associated with coal exploration outside an approved mining permit area (hereinafter called Authorized Officer), and the Authorized Officer of the surface managing agency, if different. The lessee shall undertake measures, in accordance with instructions from the Western Regional Director, or Authorized Officer, to protect cultural resources on the leased lands. The lessee shall not commence the surface disturbing activities until permission to proceed is given by the Western Regional Director or Authorized Officer.

(2) The lessee shall protect all cultural resource properties that

have been determined eligible to the National Register of Historic Places within the lease area from lease-related activities until the cultural resource mitigation measures can be implemented as part of an approved mining and reclamation or exploration plan unless modified by mutual agreement in consultation with the State Historic Preservation Officer.

(3) The cost of conducting the inventory, preparing reports, and carrying out mitigation measures shall be borne by the lessee.

(4) If cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the Western Regional Director or Authorized Officer, or the Authorized Officer of the surface managing agency, if the Western Regional Director is not available. The lessee shall not disturb such resources except as may be subsequently authorized by the Western Regional Director or Authorized Officer.

Within two (2) working days of notification, the Western Regional Director or Authorized Officer will evaluate or have evaluated any cultural resources discovered and will determine if any action may be required to protect or preserve such discoveries. The cost of data recovery for cultural resources discovered during lease operations shall be borne by the lessee unless otherwise specified by the Authorized Officer of the BLM or of the surface managing agency, if different.

(5) All cultural resources shall remain under the jurisdiction of the United States until ownership is determined under applicable law.

(b) ***PALEONTOLOGICAL RESOURCES***

If paleontological resources, either large and conspicuous, and/or of significant scientific value are discovered during mining operations, the find will be reported to the Authorized Officer immediately. Mining operations will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by a BLM-approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological value. Operations within 250 feet of such discovery will not be resumed until written authorization to proceed is issued by the Authorized Officer. The lessee will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operations.

(c) THREATENED, ENDANGERED, CANDIDATE, or OTHER SPECIAL STATUS PLANT and ANIMAL SPECIES

The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq.*, or that have other special status. The Authorized Officer may recommend modifications to exploration and development proposals to further conservation and management objectives or to avoid activity that will contribute to a need to list such species or their habitat or to comply with any biological opinion issued by the Fish and Wildlife Service for the Proposed Action. The Authorized Officer will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act. The Authorized Officer may require modifications to, or disapprove a proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species, or result in the destruction or adverse modification of designated or proposed critical habitat.

The lessee shall comply with instructions from the Authorized Officer of the surface managing agency (BLM, if the surface is private) for ground disturbing activities associated with coal exploration on federal coal leases prior to approval of a mining and reclamation permit or outside an approved mining and reclamation permit area. The lessee shall comply with instructions from the Authorized Officer of the Office of Surface Mining Reclamation and Enforcement, or his designated representative, for all ground disturbing activities taking place within an approved mining and reclamation permit area or associated with such a permit.

(d) MULTIPLE MINERAL DEVELOPMENT

Operations will not be approved which, in the opinion of the Authorized Officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

(e) OIL AND GAS/COAL RESOURCES

The BLM realizes that coal mining operations conducted on Federal coal leases issued within producing oil and gas fields may interfere with the economic recovery of oil and gas; just as Federal oil and gas leases issued in a Federal coal lease area may inhibit coal recovery. BLM retains the authority to alter and/or modify the resource recovery and protection plans for coal operations and/or oil and gas operations on those lands covered by Federal mineral leases so as to obtain maximum resource recovery.

(f) RESOURCE RECOVERY AND PROTECTION

Notwithstanding the approval of a resource recovery and protection plan (R2P2) by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (i) the operator/lessee fails to achieve maximum economic recovery (MER) (as defined at 43 CFR 3480.0-5(21)) of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unmineable by the operation, the operator/lessee shall submit appropriate justification to obtain approval by the Authorized Officer to leave such reserves unmined. Upon approval by the Authorized Officer, such coal beds or portions thereof shall not be subject to damages as described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or portion of the lease as authorized by statute and regulation.

In the event the Authorized Officer determines that the R2P2, as approved, will not attain MER as the result of changed conditions, the Authorized Officer will give proper notice to the operator/lessee as required under applicable regulations. The Authorized Officer will order a modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the Authorized Officer that the coal reserves have been rendered unmineable or at such time that the operator/lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the Mineral Management Service demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

(g) PUBLIC LAND SURVEY PROTECTION

The lessee will protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration, or damage during operations on the lease areas. If any monuments, corners or accessories are destroyed, obliterated, or damaged by this operation, the lessee will hire an appropriate county surveyor or registered land surveyor to reestablish or restore the monuments, corners, or accessories at the same location, using surveying procedures in accordance with the "Manual of Surveying Instructions for the Survey of the Public Lands of the United States." The survey will be recorded in the appropriate county records, with a copy sent to the Authorized Officer.

Form 3400-12
(February 2005)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB NO. 1004-0073
Expires: January 31, 2007

Serial Number

COAL LEASE

PART 1. LEASE RIGHTS GRANTED

This lease, entered into by and between the UNITED STATES OF AMERICA, hereinafter called lessor, through the Bureau of Land Management (BLM), and
(Name and Address)

hereinafter called lessee, is effective *(date)* / / , for a period of 20 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of the 20th lease year and each 10-year period thereafter.

Sec. 1. This lease is issued pursuant and subject to the terms and provisions of the:
☐ Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;
☐ Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;
and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any bonuses, rents, and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants and leases to lessee the exclusive right and privilege to drill for, mine, extract, remove, or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

containing acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1. (a) RENTAL RATE -Lessee must pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $ for each lease year.

(b) RENTAL CREDITS -Rental will not be credited against either production or advance royalties for any year.

Sec. 2. (a) PRODUCTION ROYALTIES - The royalty will be percent of the value of the coal as set forth in the regulations. Royalties are due to lessor the final day of the month succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the BLM may accept, for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty will be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee must maintain in the proper office a lease bond in the amount of $. The BLM may require an increase in this amount when additional coverage is determined appropriate.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years will terminate the lease. Lessee must submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after lease issuance.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease will become an LMU or part of an LMU, subject to the provisions set forth in the regulations.

The stipulations established in an LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease will then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

(Continued on page 2)

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee must furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee must keep open at all reasonable times for the inspection by BLM the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee must allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section will be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee must comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee must not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area must be submitted to the BLM.

Lessee must carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee must take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but are not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits not covered hereunder and approving easements or rights-of-way. Lessor must condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee must: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years should be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor. Neither lessee nor lessee's subcontractors should maintain segregated facilities.

Sec. 9. (a) TRANSFERS

☐ This lease may be transferred in whole or in part to any person, association or corporation qualified to hold such lease interest.

☐ This lease may be transferred in whole or in part to another public body or to a person who will mine coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

☐ This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee will be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee must deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee must remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the BLM. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, will become the property of the lessor, but lessee may either remove any or all such property or continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor will waive the requirement for removal, provided the third parties do not object to such waiver. Lessee must, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease will be subject to cancellation by the lessor only by judicial proceedings. This provision will not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver will not prevent later cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS-IN-INTEREST - Each obligation of this lease will extend to and be binding upon, and every benefit hereof will inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION -Lessee must indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Clean Water Act (33 U.S.C. 1252 et seq.), the Clean Air Act (42 U.S.C. 4274 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.).

Sec. 15. SPECIAL STIPULATIONS

(Continued on page 3)

Sec. 15. SPECIAL STIPULATIONS (Cont'd.) -

THE UNITED STATES OF AMERICA

(Company or Lessee Name)	By
(Signature of Lessee)	(BLM)
(Title)	(Title)
(Date)	(Date)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, ictitious or fraudulent statements or representations as to any matter within its jurisdiction.

NOTICES

The Privacy Act of 1974 and the regulation in 43 CFR 2.48(d) provide that you be furnished with the following information in connection with information required by this application.
AUTHORITY: 30 U.S.C. 181-287 and 30 U.S.C. 351-359.
PRINCIPAL PURPOSE: BLM will use the information you provide to process your application and determine if you are eligible to hold a lease on BLM Land.
ROUTINE USES: BLM will only disclose the information according to the regulations at 43 CFR 2.56(d).
EFFECT OF NOT PROVIDING INFORMATION: Disclosing the information is necessary to receive a benefit. Not disclosing the information may result in BLM's rejecting your request for a lease.

The Paperwork Reduction Act of 1995 requires us to inform you that:
The BLM collects this information to authorize and evaluate proposed exploration and mining operations on public lands.
Response to the provisions of this lease form is mandatory for the types of activities specified.
The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

BURDEN HOURS STATEMENT: Public reporting burden for this form is estimated to average one hour per response including the time for reading the instructions and provisions, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0073), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, Mail Stop 401 LS, Washington, D.C. 20240.

APPENDIX E

BIOLOGICAL ASSESSMENT
FOR THE MAYSDORF LBA TRACT EIS

TABLE OF CONTENTS

Page
E-1.0 INTRODUCTION....E-1
E-2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES..E-4
  E-2.1 The Proposed Action....E-4
  E-2.2 Alternatives to the Proposed Action....E-7
    E-2.2.1 Alternative 1....E-7
    E-2.2.2 Alternative 2....E-7
    E-2.2.3 Alternative 3....E-9
E-3.0 CONSULTATION TO DATE....E-10
E-4.0 SPECIES HABITAT AND OCCURRENCE AND EFFECTS OF THE PROPOSED PROJECT....E-12
  E-4.1 Threatened Species....E-16
    E-4.1.1 Bald eagle (*Haliaetus leucocephalus*)....E-16
    E-4.1.2 Ute ladies'-tresses orchid (*Spiranthes diluvialis*)....E-20
  E-4.2 Endangered Species....E-23
    E-4.2.1 Black-footed ferret (*Mustela nigripes*)....E-23
E-5.0 SUMMARY OF DETERMINATIONS....E-25
E-6.0 REGULATORY REQUIREMENTS AND MITIGATION....E-26
E-7.0 CUMULATIVE IMPACTS....E-27
E-8.0 CREDENTIALS OF SURVEY PERSONNEL....E-30
E-9.0 REFERENCES AND LITERATURE CITED....E-31

LIST OF TABLES

Table E-1. Effects Evaluation of Federal T&E Species in the Area of the Maysdorf LBA Tract....E-25

LIST OF FIGURES

Figure E-1. General Location Map with Federal Coal Leases and LBA Tracts....E-2

Figure E-2a. Maysdorf LBA Alternative Tract Configurations....E-3

Figure E-2b. Maysdorf LBA Preferred Alternative Tract Configuration....E-3

Figure E-3. Surface Ownership Within and Adjacent to the Maysdorf LBA Tract....E-5

Figure E-4. T&E Animal Species Survey Area for the Cordero Rojo Mine and Maysdorf LBA Tract....E-14

Figure E-5. Bald Eagle Roost Location with Respect to Nearby Disturbance Areas, Powerlines, and Sheep Ranching Operation....E-18

E-1.0 INTRODUCTION

In 2001, Cordero Mining Company (CMC), operator of the Cordero Rojo Mine in Campbell County, Wyoming filed an application with the Bureau of Land Management (BLM) to lease the federal coal reserves included in a maintenance coal tract under the regulations at 43 CFR 3425, Leasing on Application. The environmental impacts of leasing this tract are being evaluated in the Maysdorf Coal Lease Application Environmental Impact Statement (EIS). The tract, referred to as the Maysdorf Lease by Application (LBA) Tract, and applicant mine are shown in Figures E-1, E-2a, and E-2b. The Cordero Rojo Mine is comprised of the Cordero Mining Company (CMC) Mine and the contiguous Caballo Rojo, Inc. (CRI) Mine. CMC is presently consolidating the Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD) mining permits for the CMC and CRI Mines into a single WDEQ/LQD mining permit for the Cordero Rojo Mine; the combined permit area will include approximately 16,804 acres.

The purpose of this Biological Assessment is to provide information about the potential effects that leasing the Maysdorf LBA Tract would have on federally listed threatened or endangered (T&E) species. T&E species are managed under the authority of the Endangered Species Act (ESA) of 1973 (PL 93-205, as amended). The ESA requires Federal agencies to ensure that all actions which they authorize, fund, or carry out are not likely to jeopardize the continued existence of any federally listed species or result in the destruction or adverse modification of their critical habitat. BLM does not authorize mining by issuing a lease for federal coal, but the impacts of mining the coal are considered at the leasing stage because it is a logical consequence of issuing a lease.

This Biological Assessment was prepared to disclose the possible effects to T&E species (plant and animal) that are known to be present or that may be present within the area influenced by the Proposed Action and the alternatives to the Proposed Action being evaluated by the BLM. It was prepared in accordance with Section 7 of the ESA.

Biological Assessment objectives are:

1. To comply with the requirements of the ESA that actions of federal agencies not jeopardize or adversely modify critical habitat of federally listed species.

2. To provide a process and standard by which to ensure that threatened or endangered species receive full consideration in the decision making process.

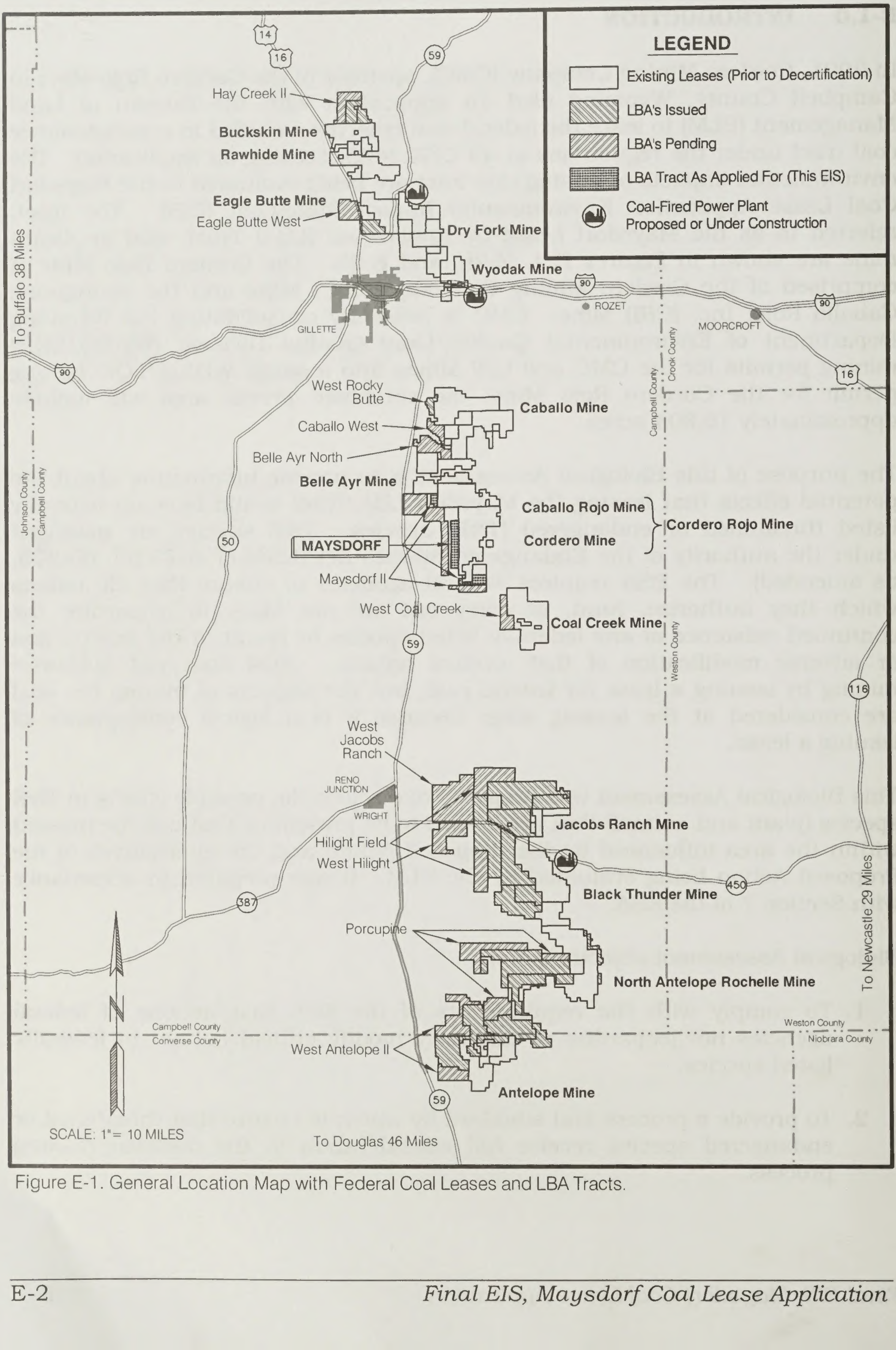

LEGEND
Existing Leases (Prior to Decertification)
LBA's Issued
LBA's Pending
LBA Tract As Applied For (This EIS)
Coal-Fired Power Plant Proposed or Under Construction
14
16
59
Hay Creek II
Buckskin Mine
Rawhide Mine
Eagle Butte Mine
Eagle Butte West
Dry Fork Mine
Wyodak Mine
90
ROZET
MOORCROFT
GILLETTE
To Buffalo 38 Miles
West Rocky Butte
Caballo Mine
Caballo West
Belle Ayr North
Belle Ayr Mine
Caballo Rojo Mine
Cordero Rojo Mine
Cordero Mine
MAYSDORF
Maysdorf II
West Coal Creek
Coal Creek Mine
Campbell County
Crook County
Weston County
Johnson County
Campbell County
50
16
116
West Jacobs Ranch
RENO JUNCTION
WRIGHT
Jacobs Ranch Mine
Hilight Field
West Hilight
Black Thunder Mine
450
387
Porcupine
North Antelope Rochelle Mine
To Newcastle 29 Miles
Campbell County
Converse County
Weston County
Niobrara County
West Antelope II
Antelope Mine
SCALE: 1" = 10 MILES
To Douglas 46 Miles

Figure E-1. General Location Map with Federal Coal Leases and LBA Tracts.

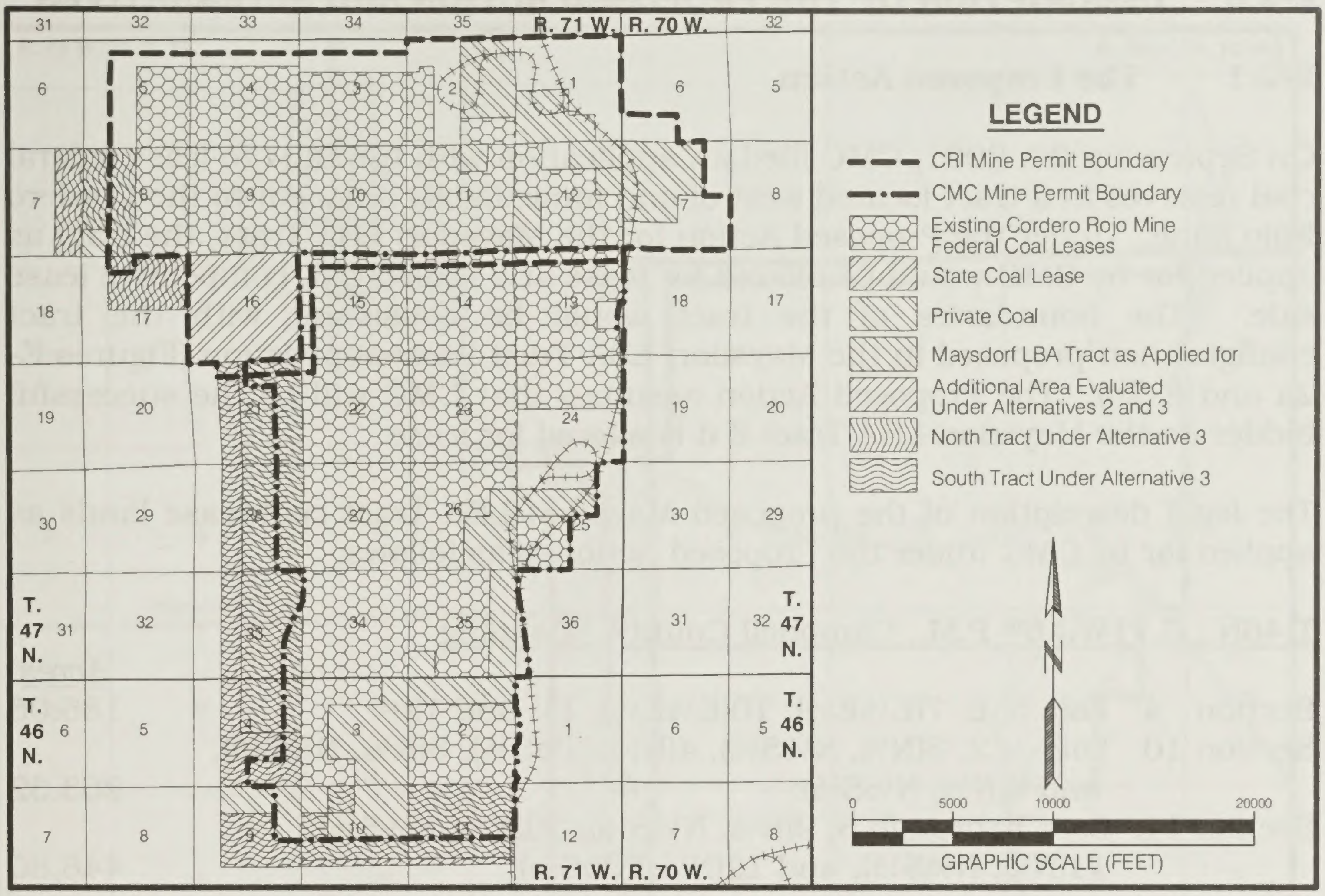

R. 71 W.
R. 70 W.
T. 47 N.
T. 46 N.
LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Existing Cordero Rojo Mine Federal Coal Leases
State Coal Lease
Private Coal
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3
South Tract Under Alternative 3
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure E-2a. Maysdorf LBA Alternative Tract Configurations.

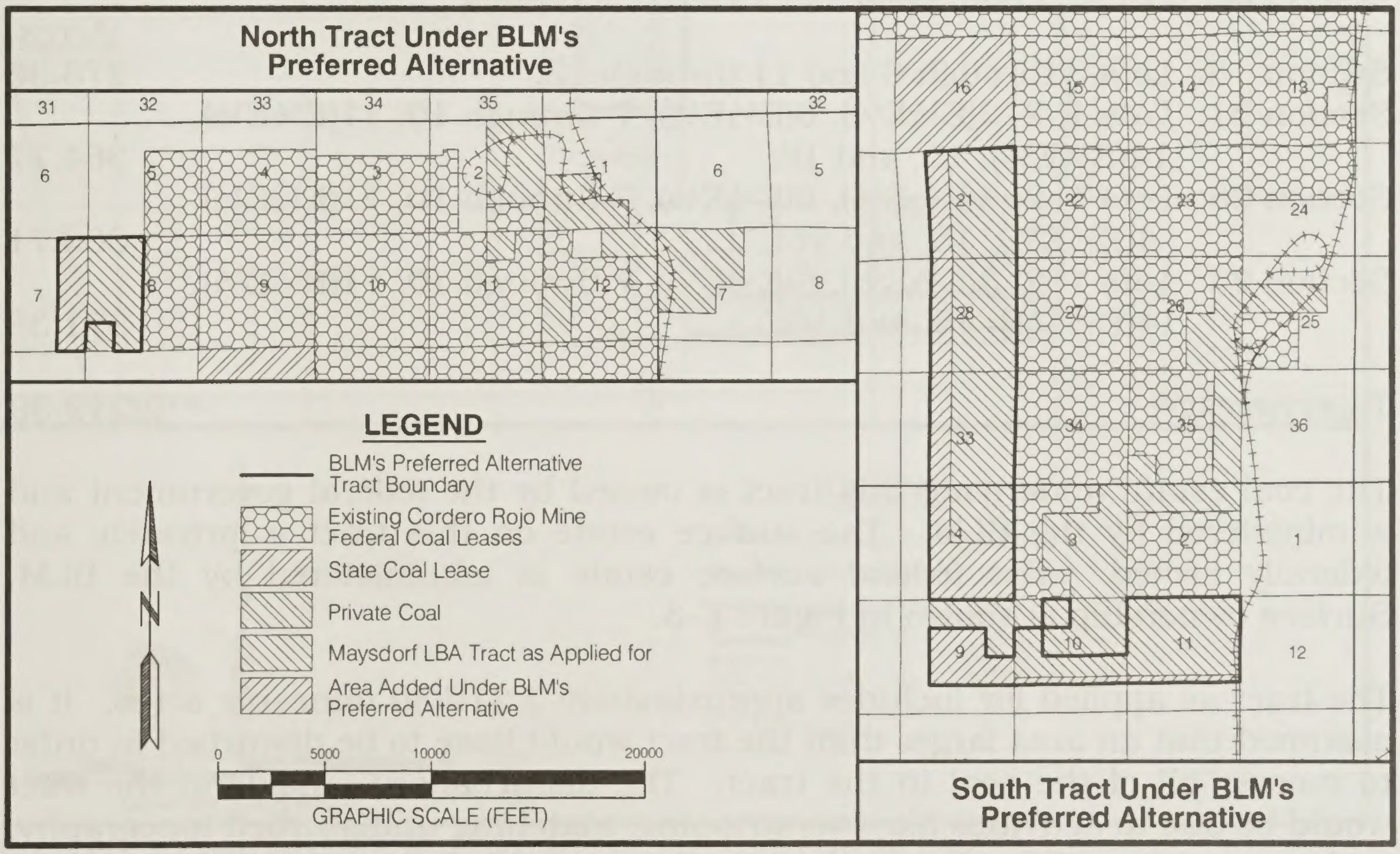

North Tract Under BLM's Preferred Alternative
South Tract Under BLM's Preferred Alternative
LEGEND
BLM's Preferred Alternative Tract Boundary
Existing Cordero Rojo Mine Federal Coal Leases
State Coal Lease
Private Coal
Maysdorf LBA Tract as Applied for
Area Added Under BLM's Preferred Alternative
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure E-2b. Maysdorf LBA Preferred Alternative Tract Configuration.

E-2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

E-2.1 The Proposed Action

On September 20, 2001, CMC filed an application with the BLM to lease federal coal reserves in a tract located west of and immediately adjacent to the Cordero Rojo Mine. Under the Proposed Action for the Maysdorf LBA Tract, the tract as applied for by CMC would be offered for lease at a sealed-bid, competitive lease sale. The boundaries of the tract would be consistent with the tract configuration proposed in the Maysdorf LBA Tract lease application (Figures E-2a and E-2b). The Proposed Action assumes that CMC will be the successful bidder on the Maysdorf LBA Tract if it is offered for lease.

The legal description of the proposed Maysdorf LBA Tract coal lease lands as applied for by CMC under the Proposed Action is as follows:

T.46N., R.71W., 6th P.M., Campbell County, Wyoming

		Acres
Section 4:	Lots 5, 6, 7(E½E½), 10(E½E½), 11, and 12;	185.05
Section 10:	Lots 1, 2, 3(N½, N½S½), 4(N½, N½S½), 5(N½, N½S½), and 6(N½, N½S½);	203.32
Section 11:	Lots 1 through 8, 9(N½, N½S½), 10(N½, N½S½), 11(N½, N½S½), and 12(N½, N½S½);	446.80

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

		Acres
Section 8:	Lots 3 through 6 and 11 through 13;	278.36
Section 21:	Lots 1, 2, 3(E½E½), 6(E½E½), 7 through 10, 11(E½E½), 14(E½E½), 15, and 16;	364.77
Section 28:	Lots 1, 2, 3(E½E½), 6(E½E½), 7 through 10, 11(E½E½), 14(E½E½), 15, and 16;	369.71
Section 33:	Lots 1, 2, 3(E½E½), 6(E½E½), 7 through 10, 11(E½E½), 14(E½E½), 15, and 16;	371.38

Total Acreage: 2,219.39

The coal estate underlying this tract is owned by the federal government and administered by the BLM. The surface estate on this tract is privately and federally owned. The federal surface estate is administered by the BLM. Surface ownership is shown in Figure E-3.

The tract as applied for includes approximately 2,219.39 mineable acres. It is assumed that an area larger than the tract would have to be disturbed in order to recover all of the coal in the tract. The disturbances outside of the tract would be due to activities like overstripping, matching undisturbed topography, and construction of flood control and sediment control structures.

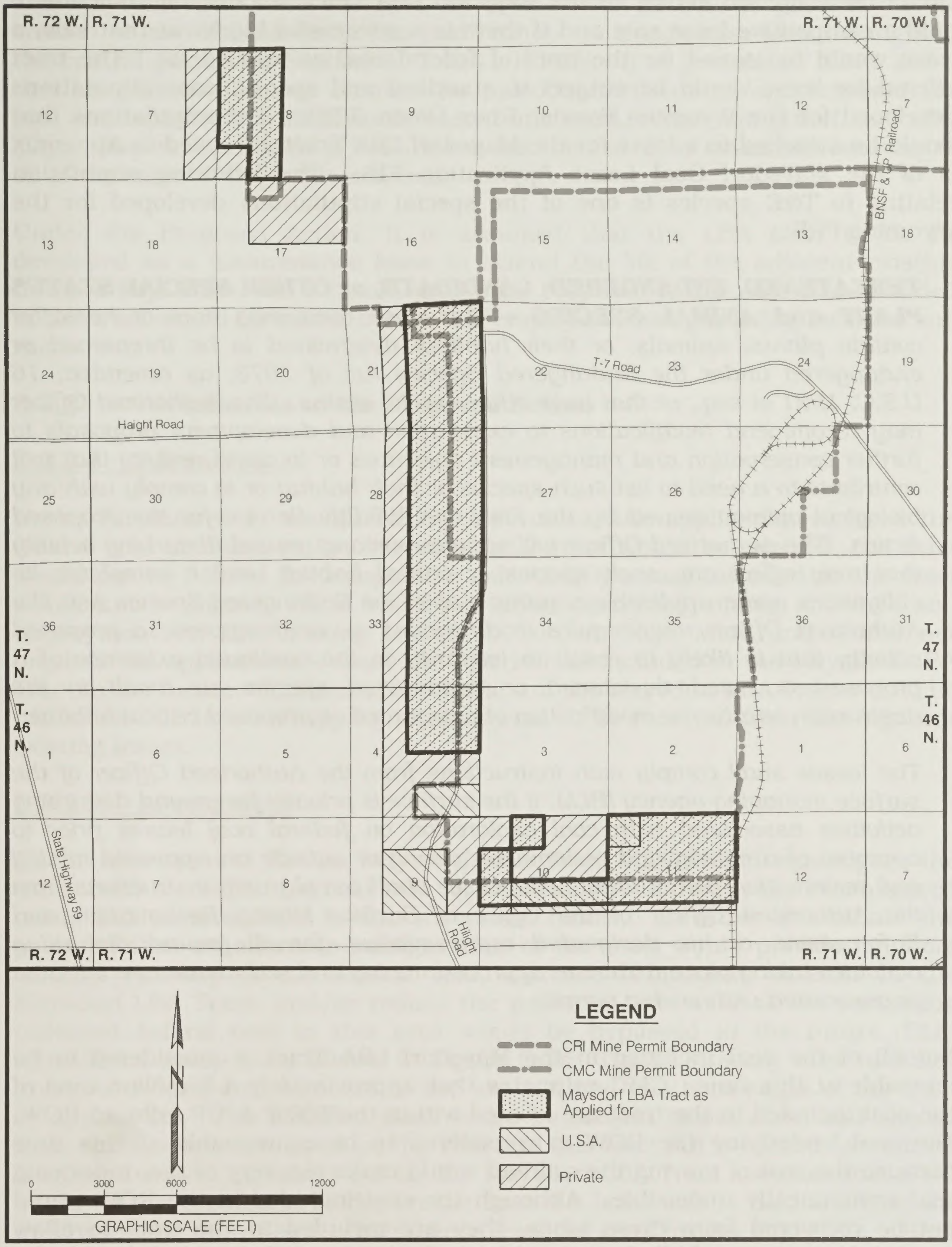

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
12
7
8
9
10
11
12
7
BNSF & UP Railroad
13
18
17
16
15
14
13
18
24
19
20
21
22
T-7 Road
23
24
19
Haight Road
25
30
29
28
27
26
30
36
31
32
33
34
35
36
31
T. 47 N.
T. 46 N.
T. 47 N.
T. 46 N.
1
6
5
4
3
2
1
6
12
7
8
9
10
12
7
State Highway 59
Hilight Road
R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
LEGEND
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Maysdorf LBA Tract as Applied for
U.S.A.
Private
0
3000
6000
12000
GRAPHIC SCALE (FEET)

Figure E-3. Surface Ownership Within and Adjacent to the Maysdorf LBA Tract.

Under the Proposed Action for the Maysdorf LBA Tract, if a decision is made to hold a competitive lease sale and if there is a successful bidder at that sale, a lease would be issued for the tract of federal coal as applied for. The tract offered for lease would be subject to standard and special lease stipulations developed for the Wyoming Powder River Basin (PRB). The stipulations that would be attached to a lease for the Maysdorf LBA Tract are listed in Appendix D of the Maysdorf Coal Lease Application EIS. The following stipulation relating to T&E species is one of the special stipulations developed for the Wyoming PRB:

> ***THREATENED, ENDANGERED, CANDIDATE, or OTHER SPECIAL STATUS PLANT and ANIMAL SPECIES*** *- The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq., or that have other special status. The Authorized Officer may recommend modifications to exploration and development proposals to further conservation and management objectives or to avoid activity that will contribute to a need to list such species or their habitat or to comply with any biological opinion issued by the Fish and Wildlife Service for the Proposed Action. The Authorized Officer will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act. The Authorized Officer may require modifications to, or disapprove a proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species, or result in the destruction or adverse modification of designated or proposed critical habitat.*
>
> *The lessee shall comply with instructions from the Authorized Officer of the surface managing agency (BLM, if the surface is private) for ground disturbing activities associated with coal exploration on federal coal leases prior to approval of a mining and reclamation permit or outside an approved mining and reclamation permit area. The lessee shall comply with instructions from the Authorized Officer of the Office of Surface Mining Reclamation and Enforcement, or his designated representative, for all ground disturbing activities taking place within an approved mining and reclamation permit area or associated with such a permit.*

Not all of the coal included in the Maysdorf LBA Tract is considered to be mineable at this time. CMC estimates that approximately 4.5 million tons of the coal included in the tract are located within the BNSF & UP railroad ROW. The coal underlying the ROW is considered to be unmineable at this time because the cost of moving the railroad would make recovery of the underlying coal economically unfeasible. Although the coal included in the ROW would not be recovered from these lands, they are included in the tract to allow maximum recovery of all the mineable coal outside of the railroad ROW and associated buffer zone and to comply with the coal leasing regulations, which do not allow leasing of less than 10-acre aliquot parts.

The Maysdorf tract also includes an area where no coal is present due to erosion or non-deposition (a "no-coal" zone). It trends east-west throughout the central portion of Section 4, T.46N., R.71W. It is postulated (CMC 2004) that an ancient drainage channel (or paleochannel) eroded and removed the coal and replaced it with unconsolidated fine sand, occasional gravel, and silty clays. The "no-coal" zone is included in the tract to allow maximum recovery of all of the surrounding mineable coal.

Under the Proposed Action, it is assumed that the LBA tract would be developed as a maintenance lease to extend the life of the adjacent existing Cordero Rojo Mine. As a result, under the Proposed Action, the coal included in the tract would be mined by existing employees, using existing facilities and roads.

E-2.2 Alternatives to the Proposed Action

E-2.2.1 Alternative 1

Under Alternative 1, the No Action Alternative, the application to lease the federal coal included in the Maysdorf LBA Tract would be rejected, the tract would not be offered for competitive sale, and the coal included in the tract would not be mined. This would not affect permitted mining activities and employment on the existing leases at Cordero Rojo Mine and would not preclude an application to lease the federal coal included in the Maysdorf LBA Tract in the future. Portions of the surface of the Maysdorf LBA Tract would be disturbed due to overstripping to allow coal to be removed from the adjacent existing leases.

E-2.2.2 Alternative 2

Under Alternative 2 for the Maysdorf LBA Tract, BLM would reconfigure the tract, hold a competitive coal sale for the lands included in the reconfigured tract, and issue a lease to the successful bidder. In order to evaluate the potential that an alternate configuration of the tract would provide for more efficient recovery of the federal coal, increase competitive interest in the Maysdorf LBA Tract, and/or reduce the potential that some of the remaining unleased federal coal in this area would be bypassed in the future, BLM identified a study area, shown in Figure E-2a The BLM study area includes unleased federal coal adjacent to the western and southern edges of the tract as applied for. The modified tract would be subject to standard and special lease stipulations developed for the PRB and this tract if it is offered for sale, as discussed above. Alternative 2 for the Maysdorf LBA Tract assumes that CMC would be the successful bidder on the tract if a lease sale is held and that the tract would be mined as a maintenance lease for the Cordero Rojo Mine. Other assumptions are the same as for the Proposed Action. The lands that BLM is considering adding to the tract are:

T.46N., R.71W., 6th P.M., Campbell County, Wyoming

		Acres
Section 4:	Lots 7(W½, W½E½), 10(W½, W½E½), 13 through 15, and 18 through 20;	305.99
Section 9:	Lots 1 through 5;	204.50
Section 10:	Lots 3(S½S½), 4(S½S½), 5(S½S½), and 6(S½S½);	40.66
Section 11:	Lots 9(S½S½), 10(S½S½), 11(S½S½), and 12(S½S½);	40.48

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

		Acres
Section 7:	Lots 5, 12, 13, and 20;	167.53
Section 17:	Lots 1 through 3, and 5 through 7;	241.27
Section 21:	Lots 3(W½, W½E½), 6(W½, W½E½), 11(W½, W½E½), and 14(W½, W½E½);	119.62
Section 28:	Lots 3(W½, W½E½), 6(W½, W½E½), 11(W½, W½E½), and 14(W½, W½E½);	124.16
Section 33:	Lots 3(W½, W½E½), 6(W½, W½E½), 11(W½, W½E½), and 14(W½, W½E½);	123.80

Total Acreage: 1,368.01

In evaluating the study area, BLM has made a decision to include all of the study area except for Section 17, T.47N., R.71W. in the Maysdorf LBA Tract, if a decision is made to offer the tract for lease.

The legal description of the BLM's preferred reconfiguration of the Maysdorf LBA Tract under Alternative 2 is as follows:

T.46N., R.71W., 6th P.M., Campbell County, Wyoming

		Acres
Section 4:	Lots 5 through 7, 10 through 15, and 18 through 20;	491.04
Section 9:	Lots 1 through 5;	204.50
Section 10:	Lots 1 through 6;	243.98
Section 11:	Lots 1 through 12;	487.28

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 7:	Lots 5, 12, 13 and 20;	167.53
Section 8:	Lots 3 through 6, and 11 through 13;	278.36
Section 21:	Lots 1 through 3, 6 through 11, and 14 through 16;	484.39
Section 28:	Lots 1 through 3, 6 through 11, and 14 through 16;	493.87
Section 33:	Lots 1 through 3, 6 through 11, and 14 through 16;	495.18

Total Acreage: 3, 346.13

CMC estimates that the reconfigured tract includes approximately 342.3 million tons of in-place coal. After eliminating coal that lies within the BNSF & UP railroad ROW (and the adjacent buffer zone), which would not be mined as discussed above, and the no-coal zone, CMC estimates that the reconfigured tract includes approximately 337.9 million tons of mineable coal. Using CMC's projected recovery factor of 94 percent, the reconfigured tract would contain about 317.6 million tons of recoverable coal.

E-2.2.3 Alternative 3

Under Alternative 3 for the Maysdorf LBA Tract, BLM is considering dividing the tract and offering two tracts for sale at separate, competitive sealed bid sales (Figure E-2b). The two tracts would each be subject to standard and special lease stipulations developed for the PRB and for each tract if they are offered for sale, as discussed above. Alternative 3, offering two tracts for sale, is the BLM's preferred alternative.

Alternative 3 for the Maysdorf LBA Tract assumes that CMC would be the successful bidder on the two tracts if lease sales are held and that the tracts would be mined as maintenance leases for the Cordero Rojo Mine. Other assumptions would be the same as for the Maysdorf LBA Tract Proposed Action.

As shown in Figure E-2a, the Maysdorf LBA Tract is comprised of three non-contiguous blocks of federal coal. Under Alternative 3, the North Maysdorf LBA Tract would consist of the northernmost block of coal and the South Maysdorf LBA Tract would consist of the two southern blocks of coal, as shown in Figure E-2b. BLM is considering dividing the tract because the north tract would potentially be of competitive interest to more than one mine.

As discussed under Alternative 2, BLM has identified a study area, described above and shown in Figure E-2a as the "Area Added Under Alternative 2". Under Alternative 3, the BLM could add all, part, or none of the study area to the Maysdorf LBA Tract as applied for.

In evaluating the study area, BLM has made a decision to include all of the study area except Section 17, T.47N., R.71W. in the Maysdorf LBA Tract, if a decision is made to offer the tract for lease.

The lands that would be included in the north tract under BLM's preferred alternative are:

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

		Acres
Section 7:	Lots 5, 12, 13, and 20;	167.53
Section 8:	Lots 3 through 6 and 11 through 13;	278.36

Total Acreage:	445.89

The lands that would be included in the south tract under BLM's preferred alternative are:

T.46N., R.71W., 6th P.M., Campbell County, Wyoming

		Acres
Section 4:	Lots 5 through 7, 10 through 15, and 18 through 20;	491.04
Section 9:	Lots 1 through 5;	204.50
Section 10:	Lots 1 through 6;	243.98
Section 11:	Lots 1 through 12;	487.28

T.47N., R.71W., 6th P.M., Campbell County, Wyoming

Section 21:	Lots 1 through 3, 6 through 11, and 14 through 16;	484.39
Section 28:	Lots 1 through 3, 6 through 11, and 14 through 16;	493.87
Section 33:	Lots 1 through 3, 6 through 11, and 14 through 16;	495.18
Total Acreage:		2,900.24

Under the Alternative 3 reconfiguration of the Maysdorf LBA Tract, the north tract would include approximately 445.89 acres containing approximately 52.8 million tons of in-place coal and the south tract would include 2,900.24 acres containing approximately 289.5 million tons of in-place coal, according to information provided by the applicant. The south tract includes the area that would not be mined within the BNSF & UP railroad ROW (and the adjacent buffer zone) and the no-coal zone, as discussed above.

E-3.0 CONSULTATION TO DATE

The locations of the existing Cordero Rojo Mine coal leases, the existing approved mine permit area, and the Maysdorf LBA Tract are shown in Figure E-2a.

The Cordero Rojo Mine and Maysdorf LBA Tract are included in the area determined to be "acceptable for further consideration for leasing" as part of the coal screening process. The coal screening process is a four-part process that includes application of the coal unsuitability criteria, which are defined in 43 CFR 3461.5. BLM has applied these coal screens to federal coal lands in Campbell County several times, starting in the early 1980s. Most recently, in 1993, BLM began the process of reapplying these screens to federal coal lands in Campbell, Converse, and Sheridan Counties. The results of this analysis were included as Appendix D of the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (BLM 2001), which can be viewed on the Wyoming BLM website at <http://www.wy.blm.gov> in the NEPA documents section. Consultation with the U.S. Fish and Wildlife Service (USFWS) occurred in conjunction with the unsuitability findings under Criterion 9 (Critical Habitat for Threatened or Endangered Plant and Animal Species), Criterion 11 (Bald or Golden Eagle Nests), Criterion 12 (Bald and Golden Eagle Roost and Concentration Areas), Criterion 13 (Falcon Nesting Site(s) and Buffer Zone(s)), and Criterion 14 (Habitat for Migratory Bird Species).

The coal screening process is discussed in Chapter 1, Section 1.5 of the Maysdorf Coal Lease Application EIS.

Appendix B of the Maysdorf Coal Lease Application EIS summarizes the unsuitability criteria, describes the general findings for the screening analyses discussed above, and presents a validation of these findings for the Maysdorf LBA Tract based on the current information.

Consultation with USFWS has previously been completed for the area included within the Cordero Rojo Mine's existing approved mining permit area, shown in Figure E-2a, as part of the mining and reclamation plan approval process. This process began when the CMC Mine and the CRI Mine were initially permitted in 1975 and 1980, respectively.

A letter dated February 11, 2002, from Michael Long, USFWS, Cheyenne, Wyoming to Debbie Messenheimer, Kennecott Energy, Gillette, Wyoming, documented approval of the current updated Raptor and Migratory Birds of High Federal Interest (MBHFI) Monitoring and Mitigation Plan for the CRI Mine.

A letter dated March 18, 2005, from Brian Kelly, USFWS, Cheyenne, Wyoming, to Jim Orpet (wildlife consultant for the Cordero Rojo Mine) of Intermountain Resources (IR) approved CMC's current Migratory Birds of High Federal Interest and Raptor Monitoring and Mitigation Plan.

USFWS provided scoping comments, including a list of the T&E species that may be present in the Maysdorf coal lease project area, to the BLM in a memorandum from Brian T. Kelly, USFWS, Wyoming Field Office, Cheyenne, Wyoming, to James Murkin, BLM, Casper Field Office, Casper, Wyoming dated February 15, 2005 (USFWS 2005). The following list of species that was provided by USFWS represents the federally listed T&E species that may be present in Campbell County, Wyoming:

Bald eagle (*Haliaetus leucocephalus*): Threatened

Black-footed ferret (*Mustela nigripes*): Endangered

Ute ladies'-tresses (*Spiranthes diluvialis*): Threatened

The February 15, 2005 memorandum provided recommendations for protective measures for T&E species in accordance with the ESA. Protective measures for migratory birds in accordance with the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) and recommendations for the protection of wetlands (under Executive Order 11990 and Section 404 of the Clean Water Act) and for other fish and wildlife resources (under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956) were also included. The memorandum identified the greater sage-grouse as a species of specific interest and the importance of identifying grouse habitats within the lease area and appropriate mitigation measures to minimize potential impacts to this species.

The Wyoming Game and Fish Department (WGFD) provided BLM with scoping comments for the CMC Maysdorf tract coal lease application in two letters from Bill Wichers, Deputy Director, WGFD, Cheyenne, Wyoming, to Nancy Doelger, BLM, Casper Field Office, Casper, Wyoming, dated March 31 and July 19, 2005 (WGFD 2005a and 2005b). WGFD recommended consideration be given to possible impacts to big game, sage grouse and their habitat, and aquatic resources of the Belle Fourche River, particularly the black bullhead, which is categorized by the state as a Status 3 species.

E-4.0 SPECIES HABITAT AND OCCURRENCE AND EFFECTS OF THE PROPOSED PROJECT

The CMC Mine began producing coal in 1976 and the CRI Mine began producing coal in 1983. Wildlife monitoring has been conducted annually for the two mines since the early 1980s. This wildlife monitoring was designed to meet the WDEQ/LQD, WGFD, and federal requirements for annual monitoring and reporting of wildlife activity on coal mining areas. Detailed procedures and site-specific requirements have been carried out as approved by WGFD and USFWS. The monitoring programs were conducted in accordance with Appendix B of WDEQ/LQD Coal Rules and Regulations. Because the areas covered in the wildlife surveys included the mines' permit areas and a large perimeter around the mines' permit boundaries, the entire Maysdorf LBA Tract has been included in baseline inventories and annual wildlife surveys conducted for the CMC and CRI Mines since wildlife surveys began.

Both the approved CMC Mine Permit 237 Term T7 (CMC 2004) and CRI Mine Permit 511 Term T6 (CRI 2002) include monitoring and mitigation measures for the Cordero Rojo Mine that are required by SMCRA and Wyoming State Law. CMC is working with the WDEQ/LQD to consolidate the CMC and CRI mining permits into a single mining permit for the Cordero Rojo Mine. CMC anticipates approval of the permit consolidation in late 2006 or early 2007. If the Maysdorf LBA Tract is acquired by CMC, these monitoring and mitigation measures would be extended to cover operations on the LBA tract when the Cordero Rojo Mine's mining permit is amended to include the tract. This amended permit would have to be approved before mining operations could take place on the tract. These monitoring and mitigation measures are considered to be part of the Proposed Action and the Alternatives 2 and 3 during the leasing process because they are regulatory requirements.

Background information on T&E species in the vicinity of the Maysdorf LBA Tract was drawn from several sources, including: wildlife survey reports submitted by CMC and CRI to the WDEQ/LQD from the 1970s through 2005, the Final South Powder River Basin Coal EIS (BLM 2003), a Wyoming Natural Diversity Database search (University of Wyoming 2001), and from WGFD and USFWS records and contacts in 2005.

Site-specific data for a substantial portion of the tract as applied for and the study area for Alternatives 2 and 3 were obtained from several sources, including WDEQ/LQD permit applications and annual wildlife reports for the CMC and CRI Mines and other nearby coal mines. Baseline wildlife studies were conducted by Intermountain Resources (IR) expressly for the Maysdorf LBA Tract beginning in February of 2005 and continuing through December of 2005. Figure E-4 depicts T&E animal species survey areas for the Cordero Rojo Mine and Maysdorf LBA Tract.

The topography within the vicinity of the LBA tract is mainly gently rolling and of moderate relief influenced by the Belle Fourche River. Elevation ranges from approximately 4,510 to 4,770 feet above sea level.

Predominant habitat types within the LBA tract and adjacent area consist primarily of sagebrush-grassland, with areas of sandy-grassland. Rough breaks and streamside bottomland areas occur primarily in the southern portion. Various relatively small parcels of crested wheatgrass pasture occur throughout the area and networks of road and well-pad disturbance areas overlay much of the sagebrush-grassland and sandy-grassland areas. There are also numerous tank batteries and miles of pipeline disturbance with varying degrees of recovering vegetation cover.

The Belle Fourche River passes through the southern part of the Maysdorf LBA Tract. All streams, including the Belle Fourche River, within and adjacent to the LBA tract are ephemeral. In response to surface discharge of groundwater associated with coal bed natural gas (CBNG) production upstream of the LBA tract, which is a relatively recent phenomenon, streamflow occurrence in the river is now more persistent. The Belle Fourche River and the distinctive shallow pools that are present along its natural course in the general analysis area are now seldom completely dry, resulting in an increase in habitat for waterfowl, shorebirds, and aquatic species. Six reservoirs used for livestock water are located in the tract, all of which are in T.47N., R.71W. Two areas on the tract do not drain toward any stream: a roughly 30-acre playa formed by a natural topographic depression exists in the northern portion of Section 4, T.46N., R.71W., and roughly a 40-acre playa formed by a natural topographic depression exists in the west-central portion of Section 21, T.47N., R.71W.

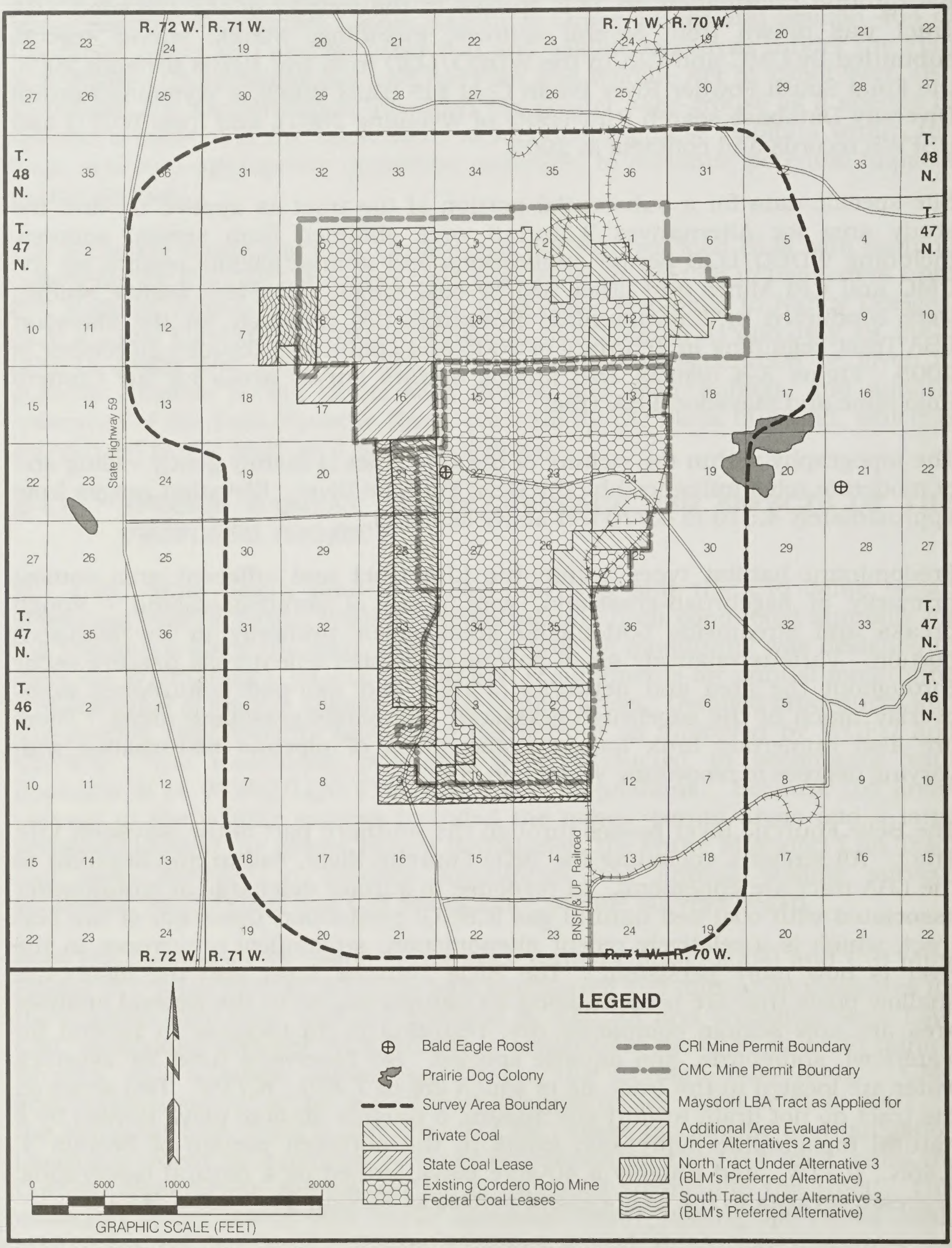

R. 72 W.
R. 71 W.
R. 71 W.
R. 70 W.
T. 48 N.
T. 47 N.
T. 46 N.
State Highway 59
BNSF & UP Railroad
LEGEND
⊕ Bald Eagle Roost
Prairie Dog Colony
Survey Area Boundary
Private Coal
State Coal Lease
Existing Cordero Rojo Mine Federal Coal Leases
CRI Mine Permit Boundary
CMC Mine Permit Boundary
Maysdorf LBA Tract as Applied for
Additional Area Evaluated Under Alternatives 2 and 3
North Tract Under Alternative 3 (BLM's Preferred Alternative)
South Tract Under Alternative 3 (BLM's Preferred Alternative)
0
5000
10000
20000
GRAPHIC SCALE (FEET)

Figure E-4. T&E Animal Species Survey Area for the Cordero Rojo Mine and Maysdorf LBA Tract.

CMC's approved mining plan currently allows disturbance of the Belle Fourche River channel. The Belle Fourche River flows roughly east-northeast through the southern portion of the LBA tract and is currently diverted from its natural channel in this area to facilitate mining within the existing Cordero Rojo Mine permit area. The diversion channel was constructed in 1995. The diversion begins within the LBA tract area, near and parallel to the northern edge of Section 11, T.46N., R.71W., then extends to the north-northeast into the mine's existing permit area, across most of Section 2, T.46N., R.71W., where it rejoins the natural channel. Another channel diversion was constructed in 1977 in Sections 25 and 26, T.47N., R.71W., as part of the mine's railroad spur and loop construction. CMC would propose another diversion of the Belle Fourche River if they acquire a lease for the Maysdorf LBA Tract.

Wetland inventories, based on USFWS NWI mapping and vegetation mapping in the field, were completed in 2005 within a 5,590.65-acre area by CMC. The wetland analysis area includes the Maysdorf LBA Tract as applied for, the lands added under Alternatives 2 and 3, and a ¼-mile disturbance buffer around the tract sufficient to mine and reclaim the tract as a part of the existing Cordero Rojo Mine operation. A formal wetland delineation has been confirmed by the U.S. Army Corps of Engineers (COE) for the portion of the wetland analysis area (1,245.96 acres) that is within the current Cordero Rojo Mine permit area. The wetland inventory for the remainder of the area would be submitted to COE for verification as part of the mining and reclamation permit process, if the tract is leased.

Within the entire wetland analysis area, a total of 154.2 acres of Waters of the U.S. have been identified, including a total of 33.2 acres of jurisdictional Waters of the U.S. Approximately 30.0 of those acres are jurisdictional wetlands. Identified jurisdictional wetlands occur immediately along the banks of the Belle Fourche River channel and at intermittent locations in upland swale drainages adjacent to the river. The 3.2 acres of jurisdictional other Waters of the U.S. that did not qualify as jurisdictional wetlands consist primarily of the open water of the Belle Fourche River.

Wetland areas previously mapped by the USFWS NWI project have been recently altered somewhat due to CBNG-related water production within and upstream of the Maysdorf tract wetland analysis area. There are an additional 121.0 acres of non-jurisdictional Waters of the U.S. also contained in the wetland analysis area that includes a large flooded playa, stockponds, depressions, and several ephemeral riverine systems that are isolated. The non-jurisdictional wetlands (78.4 acres) are associated with stockponds, depressions, and ephemeral riverine drainages that are isolated. The non-jurisdictional other Waters of the U.S. (42.6 acres) occur as an area of open water in Section 21, T.47N., R.71W., where water produced from nearby CBNG development wells is regularly discharged, which has resulted in year-round ponding in a depression/playa area.

Within the proposed lease area and adjacent study area there is no “critical” habitat designated by USFWS for T&E species. The following discussion describes species’ habitat requirements and their occurrence in the area of the Maysdorf LBA Tract and evaluates the potential environmental effects of the Proposed Action and Alternatives 2 and 3 on federally listed species.

E-4.1 Threatened Species

E-4.1.1 Bald eagle (*Haliaetus leucocephalus*)

On February 14, 1978, the bald eagle was listed as endangered in all of the coterminous United States except Minnesota, Wisconsin, Michigan, Oregon, and Washington, where it was classified as threatened (43 F.R. 6233). The USFWS reclassified the bald eagle from endangered to threatened throughout its range in the lower 48 states on July 12, 1995 (60 F.R. 36000). The bald eagle was proposed for delisting on July 6, 1999 (64 F.R. 36454). Currently, the proposal has not been finalized or withdrawn.

Biology and Habitat Requirements: Adult bald eagles establish life-long pair bonds and nest primarily in remote areas free of disturbance, in large trees that are near rivers, lakes, marshes, or other wetland areas. In Wyoming, this species builds large nests in the crowns of large mature trees such as cottonwoods or pines. Typically, there are alternate nests within or in close proximity to the nest stand. Snags and open-canopied trees near the nest site and foraging areas provide favorable perch sites. This species is a common breeding resident in some areas of Wyoming (Luce et al. 1999 and USFWS 2005).

Food availability is probably the single most important determining factor for bald eagle distribution and abundance (Steenhof 1976). Fish and waterfowl are the primary sources of food. Big game and livestock carrion, including domestic sheep carcasses, as well as rodents (e.g., ground squirrels, prairie dogs, etc.) also can be important dietary components where these resources are available (Ehrlich et al. 1988). Bald eagles are opportunistic foragers. They prefer to forage in areas with the least human disturbance (USFWS 1978, McGarigal et al. 1991).

Bald eagles that have open water or alternate food sources near their nesting territories may stay for the winter; other eagles migrate southward to areas with available prey. During migration and in winter, eagles often concentrate on locally abundant food resources and tend to roost communally at night. Communal roosts (defined as six or more eagles on any give night) usually are located in large mature trees, usually in secluded locations that offer protection from harsh weather. Large, live trees in sheltered areas provide a favorable thermal environment and help minimize the energy stress encountered by wintering eagles. Communal roosting also may facilitate food finding (Steenhof 1976) and pair bonding. Bald eagles often return to use the same nest and winter roost year after year (USFWS 2005). Freedom from human disturbance is also important in communal roost site selection (Steenhof et al. 1980, U.S. Bureau of Reclamation 1981, USFWS 1986, Buehler et al. 1991). Continued human disturbance of a night roost may cause eagles to abandon an area (Hansen et al. 1981, Keister 1981). The proximity of night roosts to the other habitats required by wintering eagles, such as hunting perches and feeding sites, is important (Steenhof et al. 1980). Roosts may be several miles from feeding sites. The absence of a suitable roost may limit the use of otherwise suitable habitat.

Existing Environment: Bald eagles are relatively common winter residents and migrants in northeastern Wyoming's PRB. Limited suitable roosting habitat is present within the current Cordero Rojo Mine permit area and the Maysdorf LBA Tract. There are no trees on the LBA tract. No known nest sites, or consistent yearly concentrated prey or carrion sources for bald eagles are present in the area of the Cordero Rojo Mine, including the Maysdorf LBA Tract and adjacent study area. However, this species is commonly observed in the general vicinity of the Maysdorf LBA Tract in the winter.

A sheep ranching operation is located west of the mine's western permit boundary on the north side of Haight Road (Figure E-5). Eagles may prey upon adult sheep carcasses in this area in the winter, although that source of food would not be consistent or abundant, and wintering migrant eagles have typically left the area prior to spring lambing season.

A known historical communal bald eagle roost is over five miles to the east of the LBA tract (SW¼ of Section 21, T.47N., R.70W.)(Figure E-4). More than 25 bald eagles were counted in this roost area on February 16 of 2005. Several isolated bald eagle nesting attempts have been recorded in the region, but all known attempts have been over 20 miles away from the Maysdorf LBA Tract.

In the winters of 2004-2005 and 2005-2006, the bald eagle was far more common and abundant in the area than in previous years and frequently used a large windbreak within the existing Cordero Rojo Mine permit area in the NW¼ of Section 22, T.47N., R.71W (see Figures E-4 and E-5). This may have been a result of mild winter conditions and the abundance of lagomorphs (rabbits) to prey upon. Lagomorph numbers appeared to be at or near a peak in their cycle. Bald eagles were first observed congregating at this site in January of 2005 but had not previously been observed concentrating in this windbreak during 25+ years of wildlife surveys in this area for the Cordero Rojo Mine and its neighboring mines. A maximum of 29 bald eagles were observed at this roost site on February 16 of 2005. When the eagles began congregating, mining operations were taking place less than ¼ mile away on an existing federal coal lease. The T-7 and Hilight Roads are located within 200 yards north and west of the windbreak, respectively (Figure E-5). The Maysdorf LBA Tract borders the west side of Hilight Road in Section 21, T.47N., R.71W. The

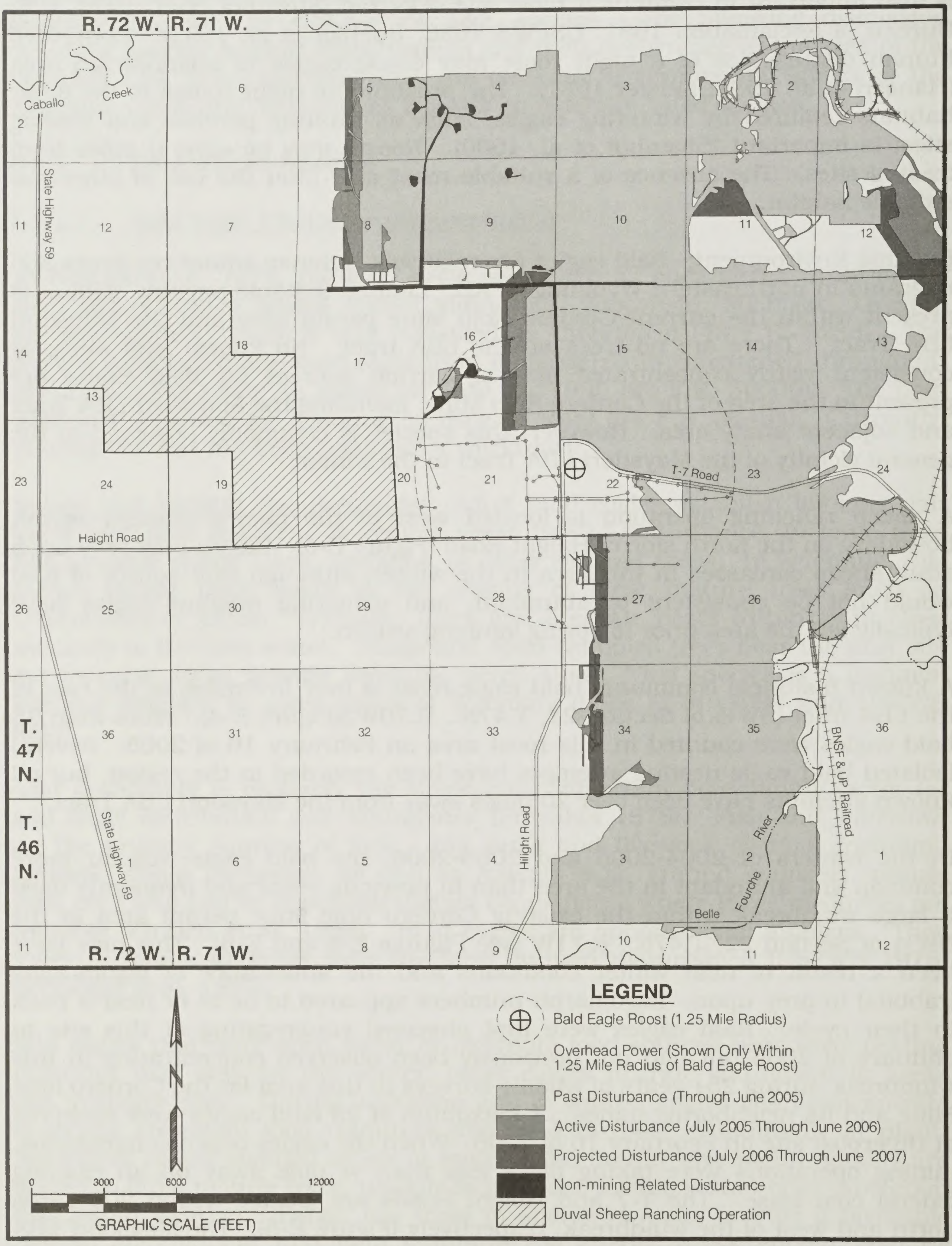

R. 72 W.
R. 71 W.
Caballo
Creek
State Highway 59
Haight Road
T-7 Road
Hilight Road
BNSF & UP Railroad
Fourche
River
Belle
T. 47 N.
T. 46 N.
R. 72 W.
R. 71 W.
LEGEND
Bald Eagle Roost (1.25 Mile Radius)
Overhead Power (Shown Only Within 1.25 Mile Radius of Bald Eagle Roost)
Past Disturbance (Through June 2005)
Active Disturbance (July 2005 Through June 2006)
Projected Disturbance (July 2006 Through June 2007)
Non-mining Related Disturbance
Duval Sheep Ranching Operation
0
3000
6000
12000
GRAPHIC SCALE (FEET)

Figure E-5. Bald Eagle Roost Location with Respect to Nearby Disturbance Areas, Powerlines, and Sheep Ranching Operation.

bald eagles have commonly been observed around mining activities and feeding on road-killed rabbits on the nearby roads.

As indicated above, this eagle roost is located on an existing federal coal lease within the current permit area for the Cordero Rojo Mine, in an area that has been approved for mining. The coal underlying the roost area is scheduled to be mined beginning in 2010. Topsoil removal would take place prior to 2010.

Bald eagle roosts or concentration areas were not observed on the Maysdorf LBA Tract during the winters of 2004-2005 or 2005-2006 or during prior wildlife monitoring surveys. No other consistently used areas with fewer than six eagles have been identified on or near the LBA tract.

Effects of the Proposed Project: **Mining the federal coal lease included in the Maysdorf LBA Tract, if the tract is leased under the Proposed Action or Alternatives 2 and 3, may affect, but is not likely to adversely affect bald eagles.** If the federal coal in the Maysdorf LBA Tract is leased under the Proposed Action or Alternatives 2 or 3, there would be an expansion of human disturbance onto the tract when it is mined. Mining operations on the Maysdorf LBA Tract could impact wintering bald eagles in the area. The tract is located alongside and west of the Hilight Road, which is near the windbreak where wintering bald eagles were observed congregating during the winters of 2004-2005 and 2005-2006 (Figure E-5). However, the windbreak is located on an existing federal coal lease (Figure E-4), which is scheduled to be disturbed by currently approved mining operations before disturbance would occur on the Maysdorf LBA Tract.

Existing overhead power lines within a 1.25-mile radius of the bald eagle roost and county roads in the area are shown in Figure E-5. These powerlines and roads would need to be removed or relocated in advance of mining operations on the existing Cordero Rojo leases and/or Maysdorf LBA Tract. The potential for bald eagles to collide with or be electrocuted by electric power lines on the mine site would be reduced due to use of raptor-safe power lines, which is required under SMCRA (30 CFR 816.97). Mine-related traffic would continue to use roads accessing Cordero Rojo Mine when the Maysdorf LBA Tract is mined, which would perpetuate the potential for vehicle-wildlife collisions and the presence of roadside carcasses and the associated potential for road kills of bald eagles foraging along roads in this area.

Disturbance to nesting eagles can cause nest failure, nest abandonment, and unsuccessful fledging of young; however, no bald eagle nests are known to exist in the area. Bald eagle foraging habitat would be lost on the tract during mining and before final reclamation; however, the Cordero Rojo Mine and Maysdorf LBA Tract areas do not provide any consistent, reliable or concentrated food sources for eagles. The loss of any potential foraging habitat would be short-term. Foraging habitat that is lost during mining would be replaced as reclamation continues on already mined out areas. Eagles may alter foraging patterns as they fly around areas of active mining activity.

Cumulative Effects: Mineral development, including CBNG development, conventional oil and gas development, and surface coal mining, is a leading cause of habitat loss within the PRB. Extensive CBNG development has occurred in and adjacent to this area. Surface coal mining has been ongoing at the Cordero Rojo Mine for almost 30 years.

E-4.1.2 Ute ladies'-tresses orchid (*Spiranthes diluvialis*)

Ute ladies'-tresses, a member of the orchid family, was listed as threatened on January 17, 1992 due to a variety of factors, including habitat loss and modification, hydrological modifications of existing and potential habitat areas, and invasion of exotic plant species. At the time of listing, Ute ladies'-tresses was only known from north-central Colorado, northern and south-central Utah, and southeastern Nevada. As of September 2005, it had also been found in western Nebraska, southeastern Wyoming, southwestern Montana, and north-central Washington, while new populations had been documented in northwestern Colorado and northern Utah (Fertig et al. 2005). USFWS has determined that a petition to remove the Ute ladies'-tresses orchid from federal protection under the ESA provides substantial biological information to indicate that removal may be warranted. The petition was received from the Central Utah Water Conservancy District (USFWS 2004).

Biology and Habitat Requirements: Ute ladies'-tresses is a perennial, terrestrial orchid with erect, glandular-pubescent stems 8 to 20 inches tall arising from tuberous-thickened roots. This species typically flowers from late July through August. The flowers are white or ivory and clustered into a spike at the top of the stem; however, depending on location and climatic conditions, it may bloom in early July or still be in flower as late as early October (USFWS 2005). Plants probably do not flower every year and may remain dormant below ground during drought years. The total known population of this species is currently estimated to be 60,000 individuals (USFWS 2004). Occurrences range in size from one plant to a few hundred individuals.

Ute ladies'-tresses has been found in a variety of habitats, including moist meadows associated with perennial stream terraces, floodplains and oxbows, seasonally flooded river terraces, subirrigated or spring-fed abandoned stream channels and valleys, and lakeshores. They have also been discovered along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside barrow pits, reservoirs, and other human-modified wetlands. The elevation range of known occurrences is from 720-1,830 feet in Washington to 7,000 feet in northern Utah (Fertig et al. 2005). Soils where the orchid has been found typically range from fine silt/sand to gravels and cobbles, as well as to highly organic and peaty soil types. The Ute ladies'-tresses orchid is not found in heavy or tight clay soils or in extremely saline or alkaline soils and seems intolerant of shade. Small scattered groups are found primarily in areas where vegetation is relatively open (USFWS 2005). The Ute ladies'-tresses orchid is commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, and arrowgrass.

Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999). The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances, such as grazing, that are common to grassland riparian habitats (USFWS 1995). Ute ladies'-tresses colonize early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbley edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. The orchid may establish in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms (USFWS 1995).

Prior to 2005, four orchid populations had been documented within Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). Five additional sites were located in 2005 (Heidel 2005). The new locations were in the same drainages as the original four populations, with two on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. No occurrences have been recorded in Campbell County.

Existing Environment: Areas of suitable habitat within the Maysdorf LBA Tract and adjacent study area were surveyed by ESCO Associates in the latter half of August 2005 and again during the same period in August 2006. Topographical and wetland delineation maps for the study area were reviewed to identify all drainages that may contain the orchid. Suitable habitat factors included less steep stream banks, light soil texture and well drained soils, close lateral or vertical distance to perennial water source during the flowering period, lack of plant competition, lack of general soil alkalinity/salinity, and current or historical management practices that did not promote overgrazing and extensive use of riparian areas. Suitable habitat was traversed on foot during the time of actual flowering of the known population, and it involved walking entire lengths of the drainages documenting locations of potential habitat and searching for this species.

No individuals of the Ute ladies'-tresses orchid were located during the 2005 and 2006 surveys. Most of the suitable habitat within the Maysdorf LBA Tract and adjacent study area is found along the Belle Fourche River and its tributaries. The river, which flows generally from west to east through the southern portion of the Maysdorf LBA Tract, is classified as an ephemeral stream in this area. Limited portions of the river receive recharge from bank storage making the stream locally intermittent. In response to surface discharge of groundwater associated with CBNG development upstream of the Maysdorf tract, which is a relatively recent phenomenon, streamflow occurrence is now more persistent and the river's channel is seldom completely dry. Several unnamed and named ephemeral tributaries of the Belle Fourche River drain portions of the Maysdorf LBA Tract. As discussed above, there are six stock reservoirs and two playas on the tract. The stock reservoirs are present on these ephemeral drainages and all are constructed earthen berms or dams. These ponds generally contain water only in early spring, then dry up in summer. There is one roughly 30-acre playa formed by a natural topographic depression in the northern portion of Section 4, T.46N., R.71W., and a second roughly 40-acre playa formed by a natural depression exists in the west-central portion of Section 21, T.47N., R.71W.

As discussed in Section E-4.0, a total of 154.2 acres of Waters of the U.S., including approximately 30.0 acres of jurisdictional wetlands and 3.2 acres of jurisdictional other Waters of the U.S., has been identified within the Maysdorf tract as applied for, the area added by Alternatives 2 and 3, and a buffer area around the tract sufficient to mine and reclaim the tract as a part of the existing Cordero Rojo Mine operation.

Effects of the Proposed Project: **Mining the federal coal included in the Maysdorf LBA Tract, if the tract is leased under the Proposed Action or Alternatives 2 and 3, may affect, but is not likely to adversely affect Ute ladies'-tresses.** Typical suitable habitat for this species is present on the tract along the Belle Fourche River valley. Outside of the Belle Fourche River valley, typical suitable habitat is rare in the study area. Surveys of the existing suitable habitat at the Cordero Rojo Mine and other mines in this area have not found any Ute ladies'-tresses. Because of the ability of this species to persist below ground or above ground without flowering, single season surveys that meet the current USFWS survey guidelines may not detect populations. If undetected populations are present, they could be lost to surface disturbing activities.

Jurisdictional wetlands located in the Maysdorf LBA Tract that are destroyed by mining operations would be replaced in accordance with the requirements of Section 404 of the Clean Water Act, as determined by the U.S. Army Corps of Engineers (COE). The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands. COE considers the type and function of each jurisdictional wetland that will be impacted and may require restoration of additional acres if the type and function of the restored wetlands will not completely replace the type and function of the original wetland. Replacement of non-jurisdictional and functional wetlands may be required by the surface landowner and/or WDEQ/LQD. WDEQ/LQD allows and sometimes requires mitigation of non-jurisdictional wetlands affected by mining, depending on the values associated with the wetland features. WDEQ/LQD also requires replacement of playas with hydrologic significance.

Cumulative Effects: Alterations of stream morphology and hydrology are believed to have extirpated Ute ladies'-tresses from most of its historical range (USFWS 2002). Disturbance and reclamation of streams by surface coal mining may alter stream morphology and hydrology. The large quantities of water produced with CBNG development and discharged on the surface may also alter stream morphology and hydrology.

E-4.2 Endangered Species

E-4.2.1 Black-footed ferret (*Mustela nigripes*)

Biology and Habitat Requirements: The black-footed ferret is a federally-listed endangered species. The black-footed ferret historically occurred throughout Texas, Oklahoma, New Mexico, Arizona, Utah, Kansas, North and South Dakota, Montana, Wyoming, Nebraska, and Colorado. The last known wild population of black-footed ferrets was discovered in Meeteetse, Wyoming in 1981. This population became decimated by canine distemper so the remaining individuals were captured and raised in protective captive breeding facilities in an effort to prevent the species' extinction (Clark and Stromberg 1987). In the early 1990s, captive-bred black-footed ferrets were released in the Shirley Basin in the first reintroduction of the species in North America. Recent survey efforts in the Shirley Basin have confirmed a self-sustaining black-footed ferret population at this reintroduction site. The Forest Service has established a Black-Footed Ferret Habitat Management Area in the Thunder Basin National Grassland, located southeast of Wright, Wyoming, where they plan to reintroduce ferrets (USDA-FS 2002).

The black-footed ferret, a nocturnally active mammal, depends almost entirely upon the prairie dog for its survival. Prairie dogs are the main food source of black-footed ferrets, and few ferrets have been collected away from prairie dog colonies. Ferrets may be present within colonies of white-tailed or black-tailed prairie dogs. The USFWS has determined that, at a minimum, potential habitat for the black-footed ferret must include a single white-tailed prairie dog colony of greater than 200 acres, or a complex of smaller colonies within a 4.3 mile (seven kilometers) radius circle totaling 200 acres (USFWS 1989). Minimum black-tailed prairie dog colony size for ferrets is 80 acres (USFWS 1989).

The decline in ferret populations has been attributed to the reduction in the extensive prairie dog colonies that historically existed in the western United States. The three major impacts that have influenced black-tailed prairie dog populations are the initial conversion of prairie grasslands to cropland in the eastern portion of its range from approximately the 1880s-1920s; large-scale control efforts conducted from approximately 1918 through 1972, when an Executive Order was issued banning the use of compound 1080; and the introduction of sylvatic plague into North American ecosystems in 1908 (USFWS 2000). In Wyoming, this species historically occurred east of the

Rocky Mountain foothills and may have occupied millions of acres (USFWS 2000). The Bureau of Sport Fisheries and Wildlife estimated that there were approximately 49,000 remaining acres of black-tailed prairie dog colonies in Wyoming in 1961. USFWS estimated that about 125,000 acres of black-tailed prairie dog occupied habitat exists in Wyoming (USFWS 2000).

Existing Environment: The Maysdorf LBA Tract is within the historical range of the black-footed ferret, although no black-footed ferrets are presently known to occur in northeastern Wyoming. During the 1980s, WGFD, in cooperation with other agencies, conducted searches for black-footed ferrets in Wyoming in the places they were most likely to be found, but these searches were not successful (Martin Grenier, personal communication, 10/14/2003). In a February 3, 2004 memorandum to the Wyoming BLM State Director, the USFWS declared that black-footed surveys are no longer necessary in black-tailed prairie dog colonies within Wyoming after evaluating the potential for a previously unidentified black-footed ferret population to occur in Wyoming.

No ferrets have been sighted during multiple years of wildlife surveys covering the CMC and CRI Mines and surrounding area.

IR has mapped the current acreage of prairie dog colonies in the vicinity of the Cordero Rojo Mine by walking the perimeters of colonies and delineating them on topographic maps. No colonies are currently present on or within two miles of the Maysdorf LBA Tract as proposed and the area added by Alternatives 2 or 3. One black-tailed prairie dog colony exists within one mile east of the Cordero Rojo Mine's current permit area while another town is located more than three miles west of the current mine permit area and the Maysdorf LBA Tract (Figure E-4). The town located east of the CMC mine permit area is currently smaller than that depicted. The boundaries shown on Figure E-4 are historical town boundaries and, although black-tailed prairie dogs still exist in the area, their numbers and distribution are much smaller than previously recorded. No evidence of ferrets has been recorded during general or specific ferret surveys over the last 29 years (1976–2005) conducted by wildlife consultants for the CMC and CRI Mines and other mines in this area.

Effects of the Proposed Project: **Mining the federal coal included in the Maysdorf LBA Tract, if a lease is issued under the Proposed Action or Alternatives 2 and 3, would have no effect on black-footed ferrets.** The black-footed ferret is almost entirely dependent on the prairie dog for survival and there are no black-tailed prairie dog colonies present on the Maysdorf LBA Tract or within the BLM study area under Alternatives 2 and 3. General wildlife surveys and specific ferret surveys have been conducted for many years at the CMC and CRI Mines, and at other mines in this area. No black-footed ferrets have ever been observed during these surveys.

The reductions in black-tailed prairie dog populations due to poisoning prior to 1972 and due to recent plague outbreaks have reduced the potential for black-footed ferret survival in northeastern Wyoming. Searches of the best remaining black-footed ferret habitat in Wyoming conducted in the 1980s were not successful in finding any ferrets.

Cumulative Effects: Mineral development within black-tailed prairie dog colonies is a leading cause of ferret habitat loss in the PRB. Surface coal mining tends to have more intense impacts on fairly localized areas, while oil and gas development tends to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. In reclaimed areas, vegetation cover may differ from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved plant species are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Shifts in habitat composition or distribution following reclamation could increase or decrease potential habitat for prairie dogs and associated habitat for black-footed ferrets in this area. However, black-tailed prairie dogs have been recorded invading and establishing towns on reclaimed coal mined lands in northeastern Wyoming (IR 2005).

Potential ferret habitat is also affected by other impacts to prairie dog populations. Plague can infect and eliminate entire prairie dog colonies. Poisoning and recreational prairie dog shooting may locally reduce prairie dog populations, but seldom completely eliminate colonies.

E-5.0 SUMMARY OF DETERMINATIONS

Table E-1 summarizes the determinations for federally listed T&E species in the area of the Maysdorf LBA Tract that may result from implementing the Proposed Action or Alternatives 2 and 3.

Table E-1. Effects Evaluation of Federal T&E Species in the Area of the Maysdorf LBA Tract.

Status	Species Common Name	Potential Effects
Threatened:	Bald eagle	May affect[1]
	Ute ladies'-tresses	May affect[1]
Endangered:	Black-footed ferret	No effect

[1] Not likely to adversely affect individuals or populations.

E-6.0 REGULATORY REQUIREMENTS AND MITIGATION

The issuance of a Federal coal lease grants the lessee the exclusive rights to mine the coal, subject to the terms and conditions of the lease. Lease ownership is necessary for mining federal coal, but lease ownership does not authorize mining operations. Surface coal mining operations are regulated in accordance with the requirements of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) and Wyoming State regulations. SMCRA gives the Office of Surface Mining Reclamation and Enforcement (OSM) primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations. Pursuant to Section 503 of SMCRA, the WDEQ developed, and in November 1980 the Secretary of the Interior approved a permanent program authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on nonfederal lands within the State of Wyoming. In January 1987, pursuant to Section 523(c) of SMCRA, WDEQ entered into a cooperative agreement with the Secretary of the Interior authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on federal lands within the state. In order to get approval of this cooperative agreement, the state had to demonstrate that the state laws and regulations are no less stringent than, meet the minimum requirements of, and include all applicable provisions of SMCRA.

If the Maysdorf LBA Tract is leased, it would be a maintenance lease for the existing Cordero Rojo Mine, which currently has both an approved Mineral Leasing Act of 1920 (MLA) mining plan and an approved State mining and reclamation permit. In the case of maintenance leases, such as the Maysdorf LBA Tract, the existing MLA mining plan and State mining and reclamation plan must be amended to include any newly leased area before that area can be mined. In order to amend the existing MLA mining plan and State mining and reclamation permit, the company would be required to submit a detailed permit application package to WDEQ before starting surface coal mining operations on any newly acquired lease. WDEQ/LQD would review the permit application package to insure the permit application complies with the permitting requirements and the coal mining operation will meet the performance standards of the approved Wyoming program. If the permit application package does comply, WDEQ would issue the applicant an amended permit that would allow the permittee to extend coal mining operations onto the newly acquired lease.

Protection of fish, wildlife, and related environmental values is required under SMCRA regulations at 30 CFR 816.97, which state:

> "No surface mining activity shall be conducted which is likely to jeopardize the continued existence of endangered or threatened species listed by the Secretary of which is likely to result in the destruction or adverse modification of designated critical habitats of such species in violation of the Endangered Species Act of 1973, as amended."

In addition to requiring the operator to minimize disturbances and adverse impacts on fish, wildlife, and related environmental values, the regulations at 30 CFR 816.97 disallow any surface mining activity which is likely to jeopardize the continued existence of endangered or threatened species and require that the operator use the best technology currently available to minimize electrocution hazards to raptors; locate and operate haul and access roads to avoid or minimize impacts on important fish and wildlife species; and design fences, conveyors, and other potential barriers to permit passage of large mammals. Section 7 consultation would be required prior to approval of the mining and reclamation plan modification. Additional measures to ensure compliance with the ESA and SMCRA can be developed when the detailed mining plan, which identifies the actual location of the disturbance areas, how and when they would be disturbed, and how they would be reclaimed, is developed and reviewed for approval. At the leasing stage, a detailed mining and reclamation plan is not available for evaluation or development of appropriate mitigation measures specific to an actual proposal to mine.

The following is a partial list of measures related to federally-listed species that are required as part of the mining and reclamation permits:

- avoiding bald eagle disturbance;
- restoring bald eagle foraging areas disturbed by mining;
- using raptor safe power lines; and
- surveying for Ute ladies'-tresses if habitat is present.

E-7.0 CUMULATIVE IMPACTS

Existing habitat-disturbing activities in the PRB include surface coal mining; conventional oil and gas and CBNG development; uranium mining; sand, gravel, and scoria mining; ranching; agriculture; road, railroad, and power plant construction and operation; recreational activities; and rural and urban housing development. Mining, construction and agricultural activities, and urban development tend to have more intense impacts on fairly localized areas, while ranching, recreational activities, and oil and gas development tend to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. The net area of energy disturbance in the Wyoming PRB has been increasing. In the short term, this means a reduction in the available habitat for T&E plant and wildlife species. In the long term, habitat is being and will continue to be restored as reclamation proceeds.

BLM is in the process of completing a regional technical study of current and proposed or potential development activity in the PRB to help the agency evaluate the impacts of coal development in the PRB. The *Powder River Basin Coal Review* consists of three tasks: Task 1 updates the BLM's 1996 status check for coal development in the PRB, Task 2 develops a forecast of reasonably foreseeable development in the PRB through the year 2020, and

Task 3 predicts cumulative impacts that would be expected to occur as a result of the projected development. The information about existing development in the following paragraphs is taken from the *Powder River Basin Coal Review* Task 2 report (BLM 2005) and BLM lease records. The completed *Powder River Basin Coal Review* reports can be accessed at the BLM Wyoming website at http://www.wy.blm.gov/minerals/coal/prb/prbdocs.htm.

The project area for Tasks 1 and 2 of the *Powder River Basin Coal Review* encompasses over eight million acres and includes all of Campbell, Sheridan, and Johnson Counties and the northern portion of Converse County in northeastern Wyoming.

Oil and gas exploration and production have been ongoing in the PRB for more than 100 years. Conventional (non CBNG) oil and gas fields are, for the most part, concentrated in the central and southern parts of the structural basin. Development of the CBNG resources from the coal beds is a more recent occurrence, with CBNG production in the Wyoming PRB starting in the late 1980s. As of 2003, an estimated 187,761 acres had been disturbed in the coal review project area as a result of oil and gas development activities, but approximately 115,045 acres of that disturbance has been reclaimed. This includes conventional oil and gas and CBNG wells and associated facilities and major transportation pipelines.

BLM estimates that the existing federal coal leases in the Wyoming PRB include approximately 121,185 acres. The currently pending federal coal LBA tracts (including the Maysdorf LBA Tract) include approximately 35,350 additional acres. The majority of the coal in the areas permitted for surface coal mining is federal, but some state and private leases are included within some of the existing mine permit areas. All of the current and proposed federal coal leases are concentrated near the outcrop of the Wyodak coal bed, which is located in eastern Campbell County and the extreme northeastern edge of Converse County. As of 2003, the baseline year for the *Powder River Basin Coal Review*, the surface coal mining operations along the Wyodak outcrop had disturbed approximately 68,794 acres. Approximately 24,097 of those acres of disturbance are occupied by “permanent” mine facilities, such as roads, buildings, coal handling facilities, etc., which are not available for reclamation until after coal mining operations end. Of the remaining 44,697 acres of disturbance available for reclamation, approximately 21,238 acres had been reclaimed.

The *Powder River Basin Coal Review* identified an estimated 4,891 additional acres of coal-related development disturbance (i.e., coal-fired power plants, railroads, and coal technology projects) as of 2003.

The estimated total development-related disturbance in the Wyoming PRB in 2003 was 264,704 acres. In addition to the coal and oil and gas development discussed above, this total includes other types of development disturbance, such as reservoirs and industrial fabrication firms, as well as public and private infrastructure, such as highways and roads, government buildings, and residential and commercial real estate development. It should be noted that some of these disturbances overlap one another. In such cases, the disturbance acreage is counted separately under each category, but is not counted twice in determining the total area of disturbance.

Cumulative effects would also occur to T&E plant and wildlife resources as a result of indirect impacts. One factor is the potential import and spread of noxious weeds around roads and facilities. Noxious weeds have the ability to displace native vegetation and hinder reclamation efforts. Control of noxious weeds is addressed in surface coal mining and reclamation plans. If weed mitigation and preventative procedures are applied to all construction and reclamation practices, the impact of noxious weeds on T&E plants and wildlife would be minimized.

In reclaimed areas, vegetation cover often differs from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the species in the approved reclamation seed mixtures are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats. In the short-term in particular, species composition, shrub cover, and other environmental factors are likely to differ from pre-disturbance vegetation communities and habitats. Establishment of noxious weeds and alteration of vegetation in reclaimed areas has the potential to alter T&E plant and wildlife habitat composition and distribution.

Potential adverse effects to listed and proposed species that have occurred and would continue to occur as a result of existing and potential future activities in the PRB would include direct loss of habitat, indirect loss of habitat due to human and equipment disturbance, habitat fragmentation, displacement of bald eagle prey species and the resultant change in bald eagle foraging, and mortality caused by equipment activities, motor vehicle collisions, power line collisions, and power line electrocution. The existing mines have developed mitigation procedures, as required by SMCRA (at 30 CFR 816.97) and Wyoming State regulations, to protect T&E species. These procedural requirements would be extended to include mining operations on the Maysdorf LBA Tract, if it is leased as proposed and after required detailed plans to mine the coal and reclaim the mined-out areas are developed and approved.

E-8.0 CREDENTIALS OF SURVEY PERSONNEL

Intermountain Resources of Laramie, Wyoming

Jim Orpet

Mr. Orpet obtained a Bachelors of Science degree in Wildlife Management and a Master of Science degree in Range Management from the University of Wyoming and has accumulated over 27 years of field experience in wildlife surveys. This experience includes surveys for T&E species, surveys for species of high state or federal interest and preparation of wildlife reports for over 100 projects throughout Wyoming. Mr. Orpet was qualified in 1987 by the WDEQ/LQD to conduct T&E and other plant and animal surveys on Abandoned Mine Lands (AML) projects within the state. Qualification at that time was based on review and approval of Mr. Orpet's credentials by the WGFD and the USFWS. Mr. Orpet has also completed numerous wetland surveys that have been approved by the COE.

Russel Tait

Mr. Tait obtained a Bachelor of Science degree in Wildlife Management from the University of Wyoming and has accumulated 13 years of field experience in wildlife surveys in Wyoming. Mr. Tait has assisted Mr. Orpet in completion of wildlife inventories for over eight years on coal mines and other resource development projects in Wyoming, including black-footed ferret surveys, bald eagle surveys, sage grouse lek surveys and surveys for other species of high federal or state interest.

ESCO Associates Inc. of Boulder, Colorado

David Buckner

Mr. Buckner obtained a Bachelors of Arts degree, Master of Arts degree, and Ph.D. in Plant Ecology from the University of Colorado and has accumulated over 20 years of field experience in vegetation and rare plant surveys.

Mr. Buckner's rare plant survey experience includes:

- *Asclepias ruthiae*, Grand County, Utah, 1982;
- *Stellaria irrigua*, La Plata County, Colorado;
- *Sclerocactur glaucus*, Mesa and Garfield Counties, Colorado, 1987;
- *Penstemon harringtonii*, Eagle, Grand, and Routte Counties, Colorado, 1982, 1990, 1991, 1993, and 1994.

Mr. Buckner's familiarity with *Spiranthes diluvialis* includes:

- observation of flowering populations in Boulder County, Colorado, 1991-2005;
- observation of vegetative sprouts of individuals occurring in Boulder County populations, January to April 1982, June 1993, and May 1995.

E-9.0 REFERENCES AND LITERATURE CITED

Bureau of Land Management (BLM), 2001, Approved Resource Management Plan (RMP) for Public Lands Administered by the Bureau of Land Management, Buffalo Field Office, Buffalo, Wyoming.

______, 2003, Final South Powder River Basin Coal Environmental Impact Statement, December 2003, Casper Field Office, Casper, Wyoming.

______, 2005, Task 2 Report for the Powder River Basin Coal Review, Past, Present, and Reasonably Foreseeable Development Activities. Prepared for BLM Casper Field Office, Casper, Wyoming, by ENSR Corporation, Fort Collins, Colorado, October 2005.

Buehler, D.A., T.J. Mersmann, J.D. Fraser, and J.K.D. Seegar, 1991, Non-breeding bald eagle communal and solitary roosting behavior and roost habitat on the northern Chesapeake Bay. Journal of Wildlife Management 55(2): 273-281.

Caballo Rojo, Inc. (CRI), 2003, Caballo Rojo Mine Permit, WDEQ/LQD Surface Mine Permit No. 511-T6, approved May 6, 2003. On file with WDEQ/LQD, Cheyenne and Sheridan, Wyoming.

Clark, T.W., and M.R. Stromberg, 1987, Mammals in Wyoming. University of Kansas, Museum of Natural History.

Cordero Mining Company (CMC), 2004, Cordero Mine Permit, WDEQ/LQD Surface Mine Permit No. 237-T7, approved September 16, 2004. On file with WDEQ/LQD, Cheyenne and Sheridan, Wyoming.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye, 1988, The Birder's Handbook: A Field Guide to the Natural History of North American Birds. Simon and Schuster, New York.

Fertig, W., and G. Beauvais, 1999, Wyoming Plant and Animal Species of Special Concern. Unpublished report. Wyoming Natural Diversity Database, Laramie, Wyoming.

Fertig, W., R. Black and P. Wolken, 2005, Rangewide status review of Ute ladies'-tresses (*Spiranthes diluvialis).* Report prepared for the U.S. Fish and Wildlife Service and Central Utah Water Conservancy District, September 30, 2005.

Grenier, Martin, Wyoming Game and Fish Department, personal communication with Nancy Doelger, BLM Casper Field Office, October 14, 2003.

Hansen, A.J., M.V. Stalmaster, and J.R. Newman, 1981, Habitat characteristics, function, and destruction of bald eagle communal roosts in western Washington. *In* R.L. Knight, G.T. Allen, M.V. Stalmaster, and C.W. Servheen, eds. Proceedings of the Washington bald eagle symposium. The Nature Conservancy, Seattle, Washington, 254 pp.

Intermountain Resources (IR), 2005, WWC Engineering's personal communication with Jim Orpet, December 13, 2005.

Heidel, Bonnie, 2005, personal communication between Tom Bills, wildife biologist, BLM Buffalo Field Office, Buffalo, Wyoming, and Bonnie Heidel, botanist, Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming.

Keister, G.P., 1981, Characteristics of winter roosts and populations of bald eagles in Klamath Basin. M.S. Thesis. Oregon State University, Corvallis, 82 pp.

Luce, B., A. Cerovski, B. Oakleaf, J. Priday, and L. Van Fleet, 1999, Atlas of Birds, Mammals, Reptiles, and Amphibians in Wyoming. Wyoming Game and Fish Department, Wildlife Division, Cheyenne, Wyoming.

McGarigal, K., R.G. Anthony, and F.B. Isaacs, 1991, Interactions of humans and bald eagles on the Columbia River estuary. Wildlife Monograph 115:1-47.

Steenhof, K., 1976, The ecology of wintering bald eagles in southeastern South Dakota. M.S. Thesis. University of Missouri, Columbia, 148 pp.

Steenhof, K., S.S. Berlinger, and L.H. Fredrickson, 1980, Habitat use by wintering bald eagles in South Dakota. Journal of Wildlife Management 44(4): 798-805.

University of Wyoming, 2001, Data search for species listed with the Wyoming Natural Diversity Database. Letter and computer printouts from A.J. Fedder to G. McKee (TWC), dated April 16, 2001.

U.S. Department of Agriculture-Forest Service (USDA-FS), 2002, Supplemental Information Report disclosing changes to black-tailed prairie dog habitat within proposed management area 3.63 of the Thunder Basin National Grassland Plan resulting from the 2001 Sylvatic plague outbreak. January 14, 2002.

U.S. Bureau of Reclamation, 1981, A survey of wintering bald eagles and their habitat in the Lower Missouri Region. Denver, Colorado, 96 pp.

U.S. Fish and Wildlife Service (USFWS), 1978, Management of wintering bald eagles. FWS/OBS-78/79. Washington, D.C., 59 pp.

______, 1986, Recovery plan for the Pacific bald eagle. Portland, Oregon, 160 pp.

______, 1989, Black Footed Ferret Survey Guidelines for Compliance with the Endangered Species Act. U.S. Fish and Wildlife Service, Denver, Colorado and Albuquerque, New Mexico.

______, 1995, Ute ladies'-tresses draft recovery plan. U.S. Fish and Wildlife Service, Denver, Colorado, 46 pp.

______, 2000, 12-month finding for a petition to list the black-tailed prairie dog as threatened. Federal Register 65(24): 5476-5488.

______, 2002, Biological and Conference Opinion for the Powder River Basin Oil and Gas Project, Campbell, Converse, Johnson, and Sheridan Counties, Wyoming, Cheyenne, Wyoming, 51 pp.

______, 2004, Endangered and threatened wildlife and plants; 90-day finding on a petition to delist the Ute ladies'-tresses orchid and initiation of a 5-year review. Federal Register 69(196): 60605-60607.

______, 2005, Memorandum from Brian Kelly, Field Supervisor, USFWS Wyoming Field Office, Cheyenne, Wyoming, to James Murkin, BLM, Field Office Manager, Casper Field Office, Casper, Wyoming, dated February 15, 2005.

Wyoming Game and Fish Department (WGFD), 2005a, Letter from Bill Wichers, Deputy Director, WGFD, Cheyenne, Wyoming, to Nancy Doelger, BLM, Casper Field Office, Casper, Wyoming, dated March 31, 2005.

______, 2005b, Letter from Bill Wichers, Deputy Director, WGFD, Cheyenne, Wyoming, to Nancy Doelger, BLM, Casper Field Office, Casper, Wyoming, dated July 19, 2005.

APPENDIX F

BLM SENSITIVE SPECIES EVALUATION FOR THE MAYSDORF COAL LEASE APPLICATION EIS

BLM SENSITIVE SPECIES EVALUATION

INTRODUCTION

BLM Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. The authority for this policy and guidance comes from the Endangered Species Act (ESA), as amended; Title II of the Sikes Act, as amended; the Federal Land Policy Management Act of 1976 (FLPMA) (43 U.S.C. 1716); and the Department Manual 235.1.1A (BLM 2001).

The goals of the sensitive species policy are to:

- Maintain vulnerable species and habitat components in functional BLM ecosystems.
- Ensure sensitive species are considered in land management decisions.
- Prevent a need for species listing under the ESA.
- Prioritize needed conservation work with an emphasis on habitat.

PROJECT DESCRIPTION

Under the Proposed Action, BLM will hold a lease for the federal coal lands in the Maysdorf LBA Tract as applied for or Alternatives 2 or 3 (see Figure 2-1 and the land descriptions in Section 2.1 of this EIS). It is assumed that the applicant for the tract, CMC, would be the successful bidder and that the tract would be mined as a maintenance lease for the existing Cordero Rojo Mine. The surface estate on the Maysdorf LBA Tract includes federal and privately owned lands.

SPECIES OCCURRENCE AND HABITAT DESCRIPTIONS

Sensitive species were listed for the BLM Buffalo Field Office within its range. Some sensitive species could or do occur within the Maysdorf LBA Tract. Specialized habitat requirements (i.e., caves, cliffs, calcareous rock outcrops) make occupation for other sensitive species unlikely. Table F-1 lists BLM sensitive species, summarizes their habitat requirements, and indicates if they have been observed on or around the tract, based on the annual wildlife surveys conducted by the mine and reported in the Cordero Rojo Mine WDEQ/LQD permit documents. Additional information on occurrences of these species on the tract can be found in Section 3.10 of the Maysdorf Coal Lease Application EIS or in the supplemental information document, which is available upon request.

Table F-1. BLM Sensitive Species for the Buffalo Field Office and Habitat Requirements and Observations on Maysdorf LBA Tract[1].

Common Name *(scientific name)*	**Habitat**	**Historical Sitings on or near the Maysdorf LBA Tract**
Amphibians		
Northern leopard frog *(Rana pipiens)*	Beaver ponds, permanent water in plains and foothills	Yes, incidental siting during wildlife surveys
Spotted frog *(Ranus pretiosa)*	Ponds, sloughs, small streams	----[2]
Birds		
Baird's sparrow *(Ammodramus bairdii)*	Grasslands, weedy fields	None
Brewer's sparrow *(Spizella breweri)*	Basin-prairie shrub	Common Breeder
Burrowing owl *(Athene cunicularia)*	Grasslands, basin-prairie shrub	Uncommon Breeder
Ferruginous hawk *(Buteo regalis)*	Basin-prairie shrub, grasslands, rock outcrops	Common Breeder
Greater sage-grouse *(Centrocercus urophasianus)*	Basin-prairie shrub, mountain-foothill shrub	Common Breeder
Loggerhead shrike *(Lanius ludovicianus)*	Basin-prairie shrub, mountain-foothill shrub	Uncommon - Occasional Breeder
Long-billed curlew *(Numenius americanus)*	Grasslands, plains, foothills, wet meadows	Uncommon Breeder
Northern goshawk *(Accipiter gentilis)*	Conifer and deciduous forests	----[2]
Peregrine falcon *(Falco peregrinus)*	Cliffs	None
Sage sparrow *(Amphispiza billneata)*	Basin-prairie shrub, mountain-foothill shrub	None
Sage thrasher *(Oreoscoptes montanus)*	Basin-prairie shrub, mountain-foothill shrub	None
Trumpeter swan *(Cygnus buccinator)*	Lakes, ponds, rivers	----[2]
White-faced ibis *(Plegadis chihi)*	Marshes, wet meadows	----[2]
Yellow-billed cuckoo *(Coccyzus americanus)*	Open woodlands, streamside willow and alder groves	None

Table F-1. BLM Sensitive Species for the Buffalo Field Office and Habitat Requirements and Observations on Maysdorf LBA Tract[1] (Continued).

Common Name ***(scientific name)***	**Habitat**	**Historical Sitings on or near the Maysdorf LBA Tract**
Fish		
Yellowstone cutthroat trout *(Oncorhynchus clarki)*	Cold water streams and lakes	----[2]
Mammals		
Fringed myotis *(Myotis thysanodes)*	Conifer forests, woodland chaparral, caves and mines	----[2]
Long-eared myotis *(Myotis evotis)*	Conifer and deciduous forest, caves and mines	----[2]
Spotted bat *(Euderma maculatum)*	Cliffs over perennial water, basin-prairie shrub	----[2]
Swift fox *(Vulpes velox)*	Grasslands	None
Townsend's big-eared bat *(Corynorhinus townsendii)*	Forests, basin-prairie shrub, caves and mines	----[2]
Plants		
Porter's sagebrush *(Artemisia porteri)*	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes; 5,300 to 6,500 ft	----[2]
William's wafer parsnip *(Cymopterus williamsii)*	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; 6,000 to 8,300 ft	----[2]

[1] Source: BLM Wyoming Sensitive Species Policy and List, September 20, 2002

[2] Habitat generally lacking or very limited

REFERENCES AND LITERATURE CITED

Bureau of Land Management (BLM), 2002, BLM Wyoming Sensitive Species Policy and List September 20, 2002, available on the Internet as of February 2007: <http://www.wy.blm.gov/wildlife/02species.pdf>.

APPENDIX G

CBNG WELLS CAPABLE OF PRODUCTION ON OR IN SECTIONS ADJACENT TO THE MAYSDORF LBA TRACT

Coalbed Methane Wells Capable of Production

Cordero Rojo Mine
Maysdorf Coal Lease By Application Area

API	Company	Well Name	TWP	RNG	Section	Status
530818	Lance Oil & Gas Co.	Atkins No. 4-14	46N	71W	4	PG
530819	Lance Oil & Gas Co.	Atkins No. 4-24	46N	71W	4	PG
530823	Lance Oil & Gas Co.	Pittman No. 4-31	46N	71W	4	PG
530931	Lance Oil & Gas Co.	Kirkpatrick No. 4-11	46N	71W	4	PG
530932	Lance Oil & Gas Co.	Kirkpatrick No. 4-21	46N	71W	4	PG
530799	Lance Oil & Gas Co.	Thrush No. 5-34	46N	71W	5	PG
530800	Lance Oil & Gas Co.	Thrush No. 5-41	46N	71W	5	PG
530801	Lance Oil & Gas Co.	Thrush No. 5-42	46N	71W	5	PG
530802	Lance Oil & Gas Co.	Thrush No. 5-44	46N	71W	5	PG
530869	Lance Oil & Gas Co.	Garrett No. 5-11	46N	71W	5	PG
530951	Lance Oil & Gas Co.	Garrett No. 5-12	46N	71W	5	PG
531745	Lance Oil & Gas Co.	Garrett No. 5-13	46N	71W	5	PG
530824	Lance Oil & Gas Co.	Peters No. 8-32	46N	71W	8	PG
530825	Lance Oil & Gas Co.	Peters No. 8-42	46N	71W	8	PG
534331	Bill Barrett Corp.	CC-CBM No. 14-14	46N	71W	14	PG
534389	Bill Barrett Corp.	CC CBM No. 24-14	46N	71W	14	PG
534615	Bill Barrett Corp.	CC-CBM No. 13-14	46N	71W	14	PG
534616	Bill Barrett Corp.	CC-CBM No. 23-14	46N	71W	14	PG
542179	Bill Barrett Corp.	CC CBM Federal No. 33-14	46N	71W	14	PG
542180	Bill Barrett Corp.	CC CBM Federal No. 43-14	46N	71W	14	PG
542181	Bill Barrett Corp.	CC CBM Federal No. 34-14	46N	71W	14	PG
542182	Bill Barrett Corp.	CC CBM Federal No. 44-14	46N	71W	14	PG
543286	Bill Barrett Corp.	CC CBM Federal No. 32-14	46N	71W	14	PG

Well Data Obtained from WOGCC, May 2005.
Status Codes: FL = Flowing; SI = Shut-in; PS = Pumping Submersible

Coalbed Methane Wells (Continued)						
API	**Company**	**Well Name**	**TWP**	**RNG**	**Section**	**Status**
532393	Rim Operating Inc.	CBM A No. 24-15	46N	71W	15	PG
532745	Rim Operating Inc.	CBM A No. 23-15R	46N	71W	15	PG
534278	Rim Operating Inc.	CBM A No. 42-15	46N	71W	15	PG
534279	Rim Operating Inc.	CBM A No. 21-15	46N	71W	15	PG
534280	Rim Operating Inc.	CBM A No. 44-15	46N	71W	15	PG
532392	Rim Operating Inc.	CBM A No. 13-16	46N	71W	16	PG
532534	Rim Operating Inc.	CBM A No. 12-16	46N	71W	16	PG
532585	Rim Operating Inc.	CBM A No. 43-16R	46N	71W	16	PG
532589	Rim Operating Inc.	CBM A No. 41-16R	46N	71W	16	PG
532736	Rim Operating Inc.	CBM A No. 22-16R	46N	71W	16	PG
551220	Rim Operating Inc.	CBM A Anderson No. 43-16	46N	71W	16	PG
541898	Rocky Mountain Gas Inc.	Dunlap No. 6-24-47	47N	71W	6	PG
541914	Rocky Mountain Gas Inc.	Dunlap No. 6-34-47	47N	71W	6	PG
542186	Rocky Mountain Gas Inc.	Dunlap No. 6-13-47	47N	71W	6	PG
541908	Rocky Mountain Gas Inc.	Dunlap No. 7-22-47	47N	71W	7	PG
541909	Rocky Mountain Gas Inc.	Dunlap No. 7-21-47	47N	71W	7	PG
541910	Rocky Mountain Gas Inc.	Dunlap No. 7-31-47	47N	71W	7	PG
541911	Rocky Mountain Gas Inc.	Dunlap No. 7-41-47	47N	71W	7	PG
541912	Rocky Mountain Gas Inc.	Dunlap No. 7-32-47	47N	71W	7	PG
542748	Rocky Mountain Gas Inc.	Dunlap No. 7-23-47	47N	71W	7	PG
544412	Rocky Mountain Gas Inc.	Dunlap No. 7-13-47	47N	71W	7	PG
529869	Warren E & P Inc.	State No. 13-16	47N	71W	16	PG
530170	Warren E & P Inc.	State No. 2-16	47N	71W	16	PG
530499	Warren E & P Inc.	State No. 11-16	47N	71W	16	PG
530502	Warren E & P Inc.	State No. 14-16	47N	71W	16	PG
530540	Warren E & P Inc.	State No. 7-16	47N	71W	16	PG
530790	Lance Oil & Gas Co.	State No. 1-16	47N	71W	16	PG
530791	Lance Oil & Gas Co.	State No. 3-16	47N	71W	16	PG
530792	Lance Oil & Gas Co.	State No. 6-16	47N	71W	16	PG
530793	Lance Oil & Gas Co.	State No. 8-16	47N	71W	16	PG

Coalbed Methane Wells (Continued)						
API	**Company**	**Well Name**	**TWP**	**RNG**	**Section**	**Status**
530794	Lance Oil & Gas Co.	State No. 10-16	47N	71W	16	PG
530795	Lance Oil & Gas Co.	State No. 15-16	47N	71W	16	PG
533763	Bowden Energy Co.	MU No. 44-17	47N	71W	17	PG
533764	Bowden Energy Co.	Maysdorf Unit No. 34-17	47N	71W	17	PG
533766	Bowden Energy Co.	MU No. 12-17	47N	71W	17	PG
533767	Bowden Energy Co.	MU No. 11-17	47N	71W	17	PG
533768	Bowden Energy Co.	MU No. 22-17	47N	71W	17	PG
533769	Bowden Energy Co.	MU No. 23-17	47N	71W	17	PG
533770	Bowden Energy Co.	MU No. 13-17	47N	71W	17	PG
531368	Lance Oil & Gas Co.	Hayden No. 18-33	47N	71W	18	PG
533761	Bowden Energy Co.	MU No. 41-18	47N	71W	18	PG
533765	Bowden Energy Co.	MU No. 42-18	47N	71W	18	PG
535669	Peabody Natural Gas LLC	Duvall No. 18N	47N	71W	20	PG
530972	Lance Oil & Gas Co.	Duvall CG No. 14-20	47N	71W	20	PG
530993	Lance Oil & Gas Co.	K & N CG No. 23-20	47N	71W	20	PG
531216	Lance Oil & Gas Co.	DOI No. 13-20	47N	71W	20	PG
531217	Lance Oil & Gas Co.	Duvall No. 24-20	47N	71W	20	PG
531218	Lance Oil & Gas Co.	KD No. 11-20	47N	71W	20	PG
531219	Lance Oil & Gas Co.	ND No. 12-20	47N	71W	20	PG
533762	Bowden Energy Co.	MU No. 31-20	47N	71W	20	PG
530982	Warren E & P Inc.	USA Maysdorf No. 7-21	47N	71W	21	PG
530983	Warren E & P Inc.	USA Maysdorf No. 4-21	47N	71W	21	PG
531304	Lance Oil & Gas Co.	Lake No. 13-21	47N	71W	21	PG
531305	Lance Oil & Gas Co.	Hayden No. 14-21	47N	71W	21	PG
530974	Lance Oil & Gas Co.	Haysen C G No. 34-28	47N	71W	28	PG
531303	Lance Oil & Gas Co.	BH No. 24-28	47N	71W	28	PG
531306	Lance Oil & Gas Co.	MH No. 13-29	47N	71W	29	PG
531316	Lance Oil & Gas Co.	Garrett No. 29-43	47N	71W	29	PG
531321	Lance Oil & Gas Co.	Garrett No. 29-22	47N	71W	29	PG
531322	Lance Oil & Gas Co.	Garrett No. 29-12	47N	71W	29	PG

Coalbed Methane Wells (Continued)

API	Company	Well Name	TWP	RNG	Section	Status
531799	Lance Oil & Gas Co.	L H No. 14-29	47N	71W	29	PG
531312	Lance Oil & Gas Co.	Garrett No. 32-31	47N	71W	32	PG
531314	Lance Oil & Gas Co.	Garrett No. 32-21	47N	71W	32	PG
531776	Citation Oil & Gas Corp.	Keidel No. 33-32	47N	71W	32	PG
531777	Citation Oil & Gas Corp.	Keidel No. 44-32	47N	71W	32	PG
530806	Lance Oil & Gas Co.	Haight No. 33-23	47N	71W	33	PG
530807	Lance Oil & Gas Co.	Haight No. 33-33	47N	71W	33	PG
530808	Lance Oil & Gas Co.	Haight No. 33-34	47N	71W	33	PG
531309	Lance Oil & Gas Co.	Garrett No. 33-11	47N	71W	33	PG
532295	Lance Oil & Gas Co.	SMH No. 31-33	47N	71W	33	PG
532296	Lance Oil & Gas Co.	SMM No. 41-33	47N	71W	33	PG
532297	Lance Oil & Gas Co.	SML No. 42-33	47N	71W	33	PG
532298	Lance Oil & Gas Co.	SMW No. 22-33	47N	71W	33	PG
530468	Lance Oil & Gas Co.	Hayden No. 8-28	47N	71W	28	PG
541907	Rocky Mountain Gas Inc.	Dunlap No. 6-23-47	47N	71W	6	SI
541913	Rocky Mountain Gas Inc.	Dunlap No. 6-33-47	47N	71W	6	SI
541915	Rocky Mountain Gas Inc.	Dunlap No. 6-43-47	47N	71W	6	SI
541916	Rocky Mountain Gas Inc.	Dunlap No. 6-44-47	47N	71W	6	SI
542112	Rocky Mountain Gas Inc.	Dunlap No. 6-12-47	47N	71W	6	SI
542113	Rocky Mountain Gas Inc.	RAG No. 6-22-47	47N	71W	6	SI
542301	Rocky Mountain Gas Inc.	RAG No. 6-21-47	47N	71W	6	SI
542363	Rocky Mountain Gas Inc.	Dunlap No. 6-42-47	47N	71W	6	SI
542364	Rocky Mountain Gas Inc.	Dunlap No. 6-32-47	47N	71W	6	SI
542458	Rocky Mountain Gas Inc.	Dunlap No. 6-31-47	47N	71W	6	SI
541920	Rocky Mountain Gas Inc.	Dunlap No. 7-12-47	47N	71W	7	SI
542746	Rocky Mountain Gas Inc.	Dunlap No. 7-14-47	47N	71W	7	SI
542747	Rocky Mountain Gas Inc.	Dunlap No. 7-24-47	47N	71W	7	SI
529870	Warren E & P Inc.	State No. 12-16	47N	71W	16	SI
542357	Rocky Mountain Gas Inc.	Dunlap No. 18-22-4	47N	71W	18	SI
542358	Rocky Mountain Gas Inc.	Dunlap No. 18-11-4	47N	71W	18	SI

Coalbed Methane Wells (Continued)

API	Company	Well Name	TWP	RNG	Section	Status
542359	Rocky Mountain Gas Inc.	Dunlap No. 18-12-4	47N	71W	18	SI
542360	Rocky Mountain Gas Inc.	Dunlap No. 18-21-4	47N	71W	18	SI
544551	Loral Operating LLC	Well No. 21-44	47N	71W	21	SI
544555	Loral Operating LLC	Schneider Trust No. 21-43	47N	71W	21	SI
544559	Loral Operating LLC	Well No. 21-42	47N	71W	22	SI
547248	Loral Operating LLC	Schneider Trust No. 22-14C	47N	71W	22	SI
547249	Loral Operating LLC	Schneider Trust No. 22-14	47N	71W	22	SI
547250	Loral Operating LLC	Schneider Trust No. 22-13	47N	71W	22	SI
547251	Loral Operating LLC	Schneider Coal No. 22-13C	47N	71W	22	SI
549588	Loral Operating LLC	Schneider Trust No. 22-23	47N	71W	22	SI
549596	Loral Operating LLC	Schneider Trust No. 22-24	47N	71W	22	SI
547246	Loral Operating LLC	Schneider Trust No. 27-11C	47N	71W	27	SI
547247	Loral Operating LLC	Schneider Trust No. 27-11	47N	71W	27	SI
549589	Loral Operating LLC	Schneider Trust No. 27-24	47N	71W	27	SI
549590	Loral Operating LLC	Schneider Trust No. 27-23	47N	71W	27	SI
549591	Loral Operating LLC	Schneider Trust No. 27-22	47N	71W	27	SI
549592	Loral Operating LLC	Schneider Trust No. 27-21	47N	71W	27	SI
549593	Loral Operating LLC	Schneider Trust No. 27-14	47N	71W	27	SI
549594	Loral Operating LLC	Schneider Trust No. 27-13	47N	71W	27	SI
532026	Lance Oil & Gas Co.	Garrett No. 29-11R	47N	71W	29	SI
530962	Lance Oil & Gas Co.	Garrett No. 32-32	47N	71W	32	SI
549595	Loral Operating LLC	Schneider Trust No. 27-12	47N	71W	27	SP

APPENDIX H

COMMENT LETTERS ON THE DRAFT EIS AND RESPONSES

Information Washington/WO/BLM/DOI
Sent by: Peggy S Britell

05/26/2006 08:51 AM

1A

To
jean public jeanpublic@yahoo.com
cc
Casper WYMail/CFO/WY/BLM/DOI@BLM
Subject
Re: PUBLIC COMMENTON FEDERAL REGISTER OF 5/26/06 VOL 71 #102 PG 30447

Your email has been forwarded to our Casper, Wyoming, office.

jean public <jeanpublic@yahoo.com>

05/26/2006 10:50 AM

To
WOINFO@BLM.GOV, FOE@FOE.ORG
cc

Subject
PUBLIC COMMENTON FEDERAL REGISTER OF 5/26/06 VOL 71 #102 PG 30447

FED REG DOC E6 8108
WYW 143159
WY920 1310 EI
TO LEASE NATIONALLY OWNED TAXPAYER LAND FOR $5.00 ACRE 1
PER YEAR AND DESTROY IT - THAT IS OBSCENE. - THE WILD
HORSES HAVE NO PLACE TO LIVE AND BLM SAYS IT HAS NO
LAND ON WHICH THEY CAN LIVE SO THEIR NUMBERS ARE DOWN
TO 23,000 FROM 60,000 SO IT IS CLEAR WHEN BLM TAKES 2
THIS ACTION IT IS IN FACT LYING TO AMERICANS WHO OWN
THIS LAND. THIS KIND OF LOW COST FLEECING OF THE
AMERICAN TAXPAYER IS BEING ALLOWED BY AN AGENCY FAR
TOO CLOSELY ALLIED WITH PROFITEERS AND DESTROYERS OF
OUR NATIONALLAY OWNED BY TAXPAYER LAND..

I OPPOSE THIS LEASE. THIS IS THE FLEECING OF AMERICA
AND IT IS DOWNRIGHT UNAMERICAN TO THROW THOSE WILD 2
HORSES OFF LAND LIKE THIS AND ALLOW ITS DESTRUCTION
FOR OIL AND GAS PROFITEERS WHO PAY THEIR EXECUTIVES
$246 MILLION DOLLARS A YEAR = SUCH GREED IS
UNCONSCIONABLE AND THIS IS MY OPINION.

SOMETHING IS DREADFULLY WRONG AT BLM TO LEASE ANY LAND
IN AMERICA FOR $5.00 PER ACRE PER YEAR.
B. SACHAU
15 ELM ST
FLORHAM PARK NJ 07932

Lesley A. Collins
----- Forwarded by Lesley Collins/CFO/WY/BLM/DOI on 05/26/2006 09:00 AM -----

1B

jean public <jeanpublic@yahoo.com>

05/26/2006 08:44 AM

To
WOINFO@BLM.GOV, FOE@FOE.ORG, CASPER_WYMAIL@BLM.GOV
cc

Subject
PUBLIC COMMENT ONF EDERAL REGISTER OF 5/26/06 VOL 71 #102 PG 30445

FED REG DOC E6 8085
W4060 1320-EL
WYW154432
NOA COAL MAYSDORF LEASE APPLICATION - DEIS HEARING WY
POWDER RIVER BASIN DESTRUCTION - 2200 ACRES PLUS

I OPPOSE THE COAL EXPLORATION LICENSE FOR 2,000 PLUS ACRES BEING PROPOSED BY BLM AND ITS APPLICANT CORDERO MINING. I WANT THIS OPPOSITION RECORDED IN THE RECORDS. I NOTE THAT BLM SEEMS TO LOSE MY OPPOSITIONS TO THEIR ACTIONS, LIKE THE SCALING PROPOSAL PASSED TODAY.

I WANT WILD HORSES TO BE ALLOWED TO BE ON THIS LAND. THIS DISGUSTING AGENCY CONSISTENTLY SAYS THERE IS NO LAND FOR THESE HORSES, AND THEIR NUMBERS ARE DOWN TO 23,000 FROM 60,000 JUST A FEW YEARS AGO. } 2

THE CONCENTRATION OF BLM ON DESTRUCTION OF THE ENVIRONMENT, WHICH IS OWNED BY NATIONAL TAXPAYERS AND IS BEING RAPED DAILY BY ACTIONS OF THIS AGENCY IS ABSOLUTELY HORRENDOUS.

I CERTAINLY DO OPPOSE THIS ACTION.
B. SACHAU
15 ELM ST
FLORHAM PARK NJ 07932

WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006
Phone: (307) 777-4600 Fax: (307) 777-4610
Web site: http://gf.state.wy.us

GOVERNOR
DAVE FREUDENTHAL
DIRECTOR
TERRY CLEVELAND
COMMISSIONERS
RON LOVERCHECK – President
BILL WILLIAMS, DVM – Vice President
LINDA FLEMING
CLARK ALLAN
JERRY GALLES
CLIFFORD KIRK
KERRY POWERS

2

RECEIVE
JUL 07 2006
Bureau of Land Manageme
Casper Field Office

July 6, 2006

WER 277.03
Bureau of Land Management
Casper Field Office
Draft Environmental Impact Statement
Cordero Rojo Mine
Maysdorf Tract lease application
Campbell County

Nancy Doelger
Bureau of Land Management
Casper Field Office
2987 Prospector Drive
Casper, WY 82604

Dear Ms. Doelger:

The staff of the Wyoming Game and Fish Department has reviewed the Draft EIS for the Maysdorf Tract lease by Cordero Rojo Mine in Campbell County.

We provided terrestrial wildlife and aquatic comments on this project in a letter dated March 31, 2005, and those remain valid. It appears the BLM has considered impacts to wildlife and wildlife-related recreation in the Draft EIS. We recommend the Final EIS and Record of Decision include the recommended mitigation for negative impacts.

Thank you for the opportunity to comment.

Sincerely,

Vern Stelter

for JOHN EMMERICH
DEPUTY DIRECTOR

JE:VS:gfb

cc: USFWS

United States Department of the Interior

U. S. GEOLOGICAL SURVEY
Reston, VA 20192

3

In Reply Refer To:
Mail Stop 423

July 17, 2006

Ms. Nancy Doelger
Bureau of Land Management
Casper Field Office
2987 Prospector Drive
Casper, WY 82604

RE: Review of a Draft Environmental Impact Statement for Maysdorf Tract, to the Cordero Rojo Mine in the Wyoming Powder River Basin

Dear Ms. Doelger:

The U.S. Geological Survey has reviewed the draft environmental impact statement and has no comments.

Sincerely,

/Signed/
Lloyd H. Woosley, Jr., P.E.
Chief, Environmental Affairs Program

Cc: EAP Chron, MS 423
USGS:WRD:LWOOSLEY:bjjohnso:x6832:7/17/06

Copy filed 7/24/06

4

06 JUL 24 PM 2:

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

In Reply Refer To:
ES-61411/W.02/WY06TA167

JUL 2 1 2006

Memorandum

To: Joseph Meyer, Assistant Field Manager, Bureau of Land Management, Casper Field Office, Casper, Wyoming
Attn: Nancy Doelger

From: Brian T. Kelly, Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Maysdorf Coal Lease Application, Draft Environmental Impact Statement

Thank you for submitting the Draft Environmental Impact Statement (DEIS) and Draft Biological Assessment (BA) for the Maysdorf Lease by Application (LBA) to the U.S. Fish and Wildlife Service (Service) for comments. The proposed Bureau of Land Management (BLM) action is a competitive coal lease sale and issuance of a maintenance lease to the successful bidder of the Maysdorf LBA Tract, as applied for by the Cordero Mining Company. The proposed Maysdorf LBA Tract is comprised of approximately 2,219 acres in sections 8, 21, 28, and 33 in T 47N/R 71W and Sections 4, 10 and 11 in T 46N, R 71W in Campbell County, Wyoming. In response to your request, our office has reviewed the Maysdorf LBA Tract DEIS and Draft BA and is providing the following comments pursuant to section 7(a)(2) of the Endangered Species Act of 1973, as amended (Act) (50 CFR §402.13).

The threatened and endangered species addressed in the Maysdorf LBA Tract DEIS and Draft BA are the threatened bald eagle (*Haliaeetus leucocephalus*), the endangered black-footed ferret (*Mustela nigripes*), and the threatened Ute ladies'-tresses (*Spiranthes diluvialis*). You have made a preliminary 'may affect, not likely to adversely affect' determination for the bald eagle and Ute ladies'-tresses. You have made a 'no effect' determination for the black-footed ferret.

Bald Eagle: As stated in the Maysdorf LBA Tract draft BA, bald eagles are commonly observed in the general vicinity of the Maysdorf LBA Tract during winter. During the winters of 2004-2005 and 2005-2006, bald eagles established a winter roost site in the trees of a large windbreak, on the existing Cordero Rojo Mine permit area, in the NW ¼ of Section 22 in T 47N/R 71W. As documented in the BA, a maximum of 29 bald eagles were observed at the roost site on February 16, 2005. It is not known why eagles began roosting at this site. As stated in the BA, two factors may affect the foraging opportunities for eagles using this roost. Lagamorph populations have been higher than normal in the area during the past two years, and eagles may opportunistically scavenge sheep carcasses from a ranching operation that is adjacent to the mine's western boundary. Eagles typically leave the area in the spring, and no bald eagle nests are known to occur within 20 miles of the Maysdorf LBA Tract.

1. To facilitate the evaluation of the potential effects to bald eagles from the leasing of the tract, the Service recommends that the BLM include an overlay of the Maysdorf Coal Lease Tract with a map that includes the following information: (1) the location of the bald eagle roost in the NW ¼ of Section 22 in T 47N/R 71W, (2) the location of the sheep ranching operation where eagles are known to forage, (3) the location of any other foraging concentration areas within 4 miles, (4) the location and type of current mining disturbance within 1 mile of the roost, and (5) the location of powerlines within one mile of the roost.

2 The Service recommends that if the lease of the Maysdorf Coal Tract will provide the opportunity for additional mining disturbance within 1 mile of the bald eagle roost, the BLM determine whether that disturbance will adversely affect bald eagles. The Service is concerned with future impacts resulting from the issuance of the coal lease, including the potential of powerlines associated with coal mining to cause collision mortality of bald eagles. We recommend the BLM evaluate if the lease of the Maysdorf Coal Tract will result in adverse effects to eagles due to future powerline construction. If powerlines may be built in areas with high eagle use, or across areas with frequent flight paths of eagles, the Service recommends burying those lines to avoid potential bald eagle mortality.

Black-footed ferret: The Service has no concerns with the Draft BA evaluation of effects from the leasing of the Maysdorf Coal Tract on black-footed ferrets.

3 Ute ladies'-tresses: As documented in the Draft BA, no Ute ladies'-tresses orchids were found during surveys of suitable habitat in the Maysdorf Coal Lease Tract in 2005. The Service acknowledges that the Draft BA documents the BLM's intent to conduct a second year survey for Ute ladies'-tresses for 2006, in all suitable habitat in the Maysdorf Coal Lease Tract, for inclusion in the Final BA. The Service considers 2 years of surveys for Ute ladies'-tresses, by a trained botanist, to be sufficient to determine its presence or absence in the Maysdorf Coal Lease Tract.

We appreciate the BLM's Casper Field Office efforts to ensure the conservation of endangered, threatened, and candidate species in Wyoming. If you have any questions regarding this letter, please contact Trish Sweanor at the letterhead address or phone (307) 772-2374 extension 39.

cc: BLM, Casper FO, Wildlife Biologist, Casper, WY (J. Wright)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter)
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)

5

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET- SUITE 200
DENVER, CO 80202-2466
Phone 800-227-8917
http://www.epa.gov/region08

BUREAU OF LAND [illegible]
06 JUL 31 AM 7:35

JUL 26 2006

Ref: 8EPR-N

Nancy Doelger
Casper Field Office, Bureau of Land Management
2987 Prospector Drive
Casper, WY 82600

Re: Draft Environmental Impact Statement for
the Maysdorf Coal Lease Application,
Campbell County, Wyoming
CEQ # 20060203

Dear Ms. Doelger:

The United States Environmental Protection Agency -- Region 8 (EPA) has reviewed the *Draft Environmental Impact Statement for Maysdorf Coal Lease Application.* The DEIS assesses the environmental impacts of lease by application (LBA) tracts submitted by several coal mines located southeast of Gillette, Wyoming. We submit the following comments in accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act.

EPA's main concern is assuring that air quality in the Powder River Basin (PRB) doesn't exceed the Clean Air Act standards. This coal mine is one of many sources in the PRB contributing to air quality degradation, especially of particulate matter (known as PM_{10}), which originates at coal mines.

The Draft EIS presents air quality modeling information disclosing potential cumulative impacts from other reasonably foreseeable development including expanding and new coal mines, coal-fired power plants, and coal bed methane development. Based on this modeling of the cumulative impacts, there is the potential to exceed the National Ambient Air Quality Standards (NAAQS) for PM_{10} and some of the increments under the Prevention of Significant Deterioration (PSD) regulations. Air monitoring stations near the proposed Maysdorf tract have not measured exceedances of either the 24-hour or annual PM_{10} standard. However, other PM_{10} stations in the PRB have shown a number of exceedances of the 24-hour standard, including violations as recently as 2004 at two air monitoring stations. Consequently, both monitoring data and modeling results suggest potentially significant cumulative PM_{10} impacts caused by existing development when combined with other reasonably foreseeable future development. We understand that increased activity by operators of coal bed methane projects and drought conditions have contributed to fugitive dust problems and these unregulated activities contribute to the modeled exceedances of the NAAQS.

This LBA process is one of several dozen LBAs in the PRB. Between 1992 and 2005, approximately 18 LBAs and other coal land exchanges have been completed in the PRB. It appears that at least nine more LBA processes have been initiated since that time. However, this DEIS is the first in this series to present modeling predictions of cumulative impacts that show the potential to exceed the NAAQS. Potential impacts on air quality from future LBAs and other development will require additional efforts to control point sources and fugitive sources of PM$_{10}$ to prevent the PRB from becoming a Clean Air Act non-attainment area.

1 The FEIS should identify all relevant, reasonable mitigation for air quality impacts, even if they are outside the jurisdiction of BLM. The probability of the mitigation measures being implemented should also be discussed. Furthermore, EPA believes that the FEIS should indicate a path to assure compliance with the PM$_{10}$ NAAQS. Specifically, the FEIS should outline both regulatory and non-regulatory processes that are in place to address air quality concerns in the PRB, as well as include all mitigation. We strongly recommend that BLM consider addressing additional source and fugitive dust control by the Casper and Buffalo Field Offices in cooperation with Wyoming DEQ and EPA. We have coordinated these comments with EPA's Regional Air Program and suggest we convene a meeting with BLM, DEQ, and EPA (NEPA and Air) to discuss these issues.

Based on the procedures EPA uses to evaluate the potential effects of proposed actions and the adequacy of the information in the DEIS, the proposed alternative will be listed in the Federal Register in the category EC-2 (EC - Environmental Concerns, 2 - Insufficient Information). This rating means that EPA's review of the proposed actions has identified environmental impacts to air quality that should be avoided in order to fully protect the environment and the DEIS does not contain sufficient information to thoroughly assess environmental impacts that should be avoided to fully protect the environment. Corrective measures may require changes to the proposed action or application of mitigation measures that can reduce the environmental impact, and the inclusion of additional information in the FEIS. Please see the enclosed detailed comments for specifics on our environmental and information concerns.

We appreciate your interest in our comments. If you have any further questions, please contact Weston Wilson of my staff at 303/312-6562.

Sincerely,

Larry Svoboda
Director, NEPA Program
Office of Ecosystems Protection
and Remediation

Enclosure
cc: David Finley, Wyoming DEQ, Cheyenne

Environmental Protection Agency - Region 8 Detailed Comments
Draft Environmental Impact Statement for the Maysdorf Coal Lease Application, Campbell County, Wyoming

Air Quality

1. The last sentence of the second paragraph of section 3.4.1.1 (page 3-20) includes the following description of the NAAQS and Wyoming Ambient Air Quality Standards (WAAQS): "The NAAQS and WAAQS set the absolute upper limits for specific air pollutant concentrations at all locations where the public has access." The reference to "absolute upper limits" is misleading. BLM's recent Draft EIS for the Pit 14 Coal Lease-by-Application (Black Butte Mine) has the following wording: "The NAAQS and WAAQS are health-based criteria for the maximum acceptable concentrations of air pollutants at all locations to which the public has access." We recommend that the FEIS have similar wording.

2. BLM should bring the information on the NAAQS and WAAQS for particulate matter as $PM_{2.5}$ up to date. Section 3.4.2.1 of the DEIS states that "the State of Wyoming will not enforce that standard until EPA has completed its review of the $PM_{2.5}$ standard and has determined to retain and enforce the standard as promulgated on July 18, 1997." EPA issued official designations of areas not attaining the $PM_{2.5}$ standard on December 17, 2004 and made modifications in April 2005.

3. The cumulative impact analysis should include additional coal and energy development activities. The reasonably foreseeable future activities list on page 4-5 only looks at projects with firm plans. However, it is apparent from the history of the area, current trends, existing infrastructure, and coal and other energy reserves that coal mining and energy development will continue to expand. For example, recently the Wyoming Infrastructure Authority (WIA) announced it was formally soliciting a demonstration of electricity production using the coal gasification technology. The WIA is seeking a public-private partnership to convert PRB coal to electricity using integrated gasification combined cycle (IGCC) technology. WIA is seeking funding from the Department of Energy under the Energy Policy Act of 2005.

   BLM should also acknowledge that the 16 active coal mines are in a row from north of Gillette to the David Johnston mine and thus it appears likely that these mines will continue to expand and fill in this area creating a continuous strip of mines and reclaimed mines for approximately 100 miles. Estimating a width of mining of 10 miles, this potential strip of coal mines would cover one thousand square miles. Given the huge scale of energy development in this area, there is a strong potential for permanent large-scale impacts for habitat (fragmentation, loss of vital habit) ground water, riparian ecosystems, wetlands and noxious weeds. Area wide air and water quality impacts from such development would also be significant.

This broader cumulative impact analysis should also factor in the likelihood of success of reclamation/mitigation plans for various resources. Mining reclamation works well for restoring some aspects of resources such as grazing livestock and wildlife, and visual aesthetics. Other resource values (e.g., wetlands, groundwater, and unique habitats) may take a long time to return to a full function or may not be restorable at all.

Noxious weeds

Noxious weeds are an increasingly difficult problem on western lands. It appears that with coalbed methane development, noxious weeds will be an increasingly greater problem in the PRB. We note in particular that there are already several weeds identified in the grazing section which are on Wyoming's restricted list (poverty weed) or on other states' lists of noxious weeds (cheat grass). If the drought continues, this area may begin to experience cheat grass/fire cycles forcing out even more desirable plant species. The FEIS should address if additional mitigation is needed to control the spread of noxious weeds and what types of programs are being developed on an area wide basis to prevent the spread of seeds along roads via mining/construction/drilling equipment.

Wetlands Mitigation

The wetlands mitigation plan should be amended to compensate for the long-term loss of wetlands values during and following mining. The mitigation ratios may need to be increased to compensate for the temporal loss of wetlands. Wetlands obviously cease to function during the 10 to 20 years of mining. However, wetlands fed by groundwater will not regain function until the ground water table recovers. We recommend that additional mitigation be established to compensate for the long-term loss of wetland values. The mitigation plans for previous or current reclamation may provide good locations for increasing wetlands in the area. Alternatively, the mining company could improve other wetlands damaged by over grazing, poorly constructed roads or off-road vehicle damage. It is not clear from the DEIS if all wetland impacts will be mitigated. Executive Order 11990 requires that all Federal Agencies protect wetlands. The DEIS implies that reclamation costs may be a factor in determining whether all wetlands will be restored. The FEIS should clarify if all wetlands will be mitigated.

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements

Definitions and Follow-Up Action*

Environmental Impact of the Action

LO - - Lack of Objections: The Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC - - Environmental Concerns: The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO - - Environmental Objections: The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU - - Environmentally Unsatisfactory: The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 - - Adequate: EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 - - Insufficient Information: The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 - - Inadequate: EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

Response to Comment 1A & B:
B. Sachau

Comment Response 1: The rental payment on federal coal leases is actually $3.00 per acre per year: however, the rental payments represent a very minor portion of the money received by federal, state, and local governments when federal coal is leased and mined. As discussed in Section 1.1 of the EIS, at the time the coal is competitively leased, the lessee must pay a bonus that meets or exceeds the fair market value of the coal as determined by an economic evaluation completed by BLM. The lessee must also pay a royalty equal to 12.5 % of the sale price of the coal when it is mined. The bonus and royalty payments are shared with the state, with the federal half of the money going into the general fund. The surface coal mines also pay severance and ad valorum taxes to the state and property taxes to the local governments. The estimated revenue to the federal, state, and local governments is discussed in Section 3.17 of the EIS.

Since 1990, federal coal lessees have paid $2,683,014,027.69 in bonus payments for the 44,409.736 acres of federal coal that has been leased in the Wyoming Powder River Basin. The tracts that have been leased are listed in Table 1-1 of the EIS. The bonus payments to date represent an average of more than $60,000 per acre; however, the bonus price paid per acre has been increasing with time. At the most recent federal coal lease sale, the federal government received a bonus bid of almost $113,000 per acre. According to the Minerals Management Service website (http://www.mrm.mms.gov), the federal government received $397,150,902.89 in royalty payments for one year of production of federal coal in Wyoming during the most recent fiscal year.

Lands are disturbed to recover coal; however, they must be reclaimed following mining in accordance with the requirements of state and federal law. The mines are required to post bonds to cover the cost of reclamation; the final reclamation bond is not released until a minimum of 10 years has elapsed after the reclaimed area is seeded with a final seed mixture approved by the state regulatory agency. After reclamation the lands support the same uses as they did before mining. Most of the surface of the land in the Powder River Basin in privately owned, as discussed below, and the prevalent land uses in this area are grazing and wildlife. The picture on the front cover of the Maysdorf Environmental Impact Statement shows an area that was disturbed by mining operations and has since been reclaimed.

Comment Response 2: The Powder River Basin in northeast Wyoming was homesteaded in the early 1900's. Although the federal government retained ownership of the minerals underlying the surface in many areas, the surface of most of northeast Wyoming, including most of the Maysdorf Tract, is privately owned. The private surface owner determines how the surface is used, including whether or not to have wild horses on his or her land. There are no federal wild horse management areas in northeastern Wyoming and, because the surface is privately-owned, BLM is not in a position to establish wild horses or herd management areas in this part of the state of Wyoming. Wild horse herds have not lived in this part of Wyoming for many years, there were no wild horse herds in this area when surface coal mining began 25 to 30 years ago, and there are no wild horses on the Maysdorf Tract.

Response to Comment 4
U.S. Fish and Wildlife Service

Comment Response 1: A map has been added to the biological assessment which shows the information requested.

Comment Response 2: Leasing the Maysdorf LBA Tract would provide an opportunity for mining disturbance within one mile of the area where the bald eagles have roosted for the last two years. However, as we discussed when we met with you on November 20, 2006, the area where the eagles have been roosting lies within the currently approved mine permit area for the Cordero Rojo Mine. Under the approved mining and reclamation permit, the federal coal in this area is scheduled to be mined starting in 2010. Topsoil stripping would occur prior to coal mining. The disturbance of the area where the eagles have been roosting will occur prior to initiation of any mining operations on the Maysdorf LBA Tract, if it is leased. As a result, mining the Maysdorf LBA Tract, if it is leased as proposed, is not the federal action that will affect the trees where eagles were observed roosting during the winters of 2004-2005 and 2005-2006.

Comment Response 3: A second survey for Ute ladies'-tresses was conducted in August of 2006 and the biological assessment has been updated to reflect that.

Response to Comment 5
U.S. Environmental Protection Agency

Comment Response A: Mitigation measures for air quality impacts related to surface coal mining are identified in Sections 3.4.2.3 and 3.4.3.3 of the EIS for the Maysdorf LBA Tract. They are, as your comment suggests, outside of the jurisdiction of the BLM. They are under the jurisdiction of the Wyoming Department of Environmental Quality (WDEQ), which has implemented the described measures in the past and has indicated that they will continue to do so in the newly leased areas. In the Final EIS, additional information has been added to Section 3.4.2.3 regarding the Natural Events Action Plan for the Coal Mines of the Powder River Basin developed by the Air Quality Division of the

WDEQ and the Wyoming Mining Association. As discussed in the Final EIS, the Natural Events Action Plan identifies additional potential control measures for protecting public health and minimizing exceedances of the PM_{10} NAAQS. According to the Natural Events Action Plan report, which can be accessed on the internet at http://deq.state.wy.us/aqd/NEAP.asp, the Natural Events Action Plan only includes measures for control of coal mine sources because it is the coal mines' monitoring systems that have recorded the exceedances of the PM_{10} NAAQS. However, the Air Quality Division of the Wyoming DEQ may address non-coal sources separately or as an update of this Natural Events Action Plan if it is demonstrated that non-coal sources are contributing to elevated measurements in the future. BLM held a State and Federal Agency briefing to present information concerning the pending coal lease applications and our plans for processing them on November 20, 2006, in at the BLM State Office in Cheyenne. It is unfortunate that that a representative from EPA was not able to attend that meeting, as it might have provided an opportunity to discuss this topic. BLM is contemplating scheduling another federal and state agency briefing on the status of the PRB Coal Review this summer. The main topics of that briefing would be an update on the status of the PRB Coal Review water and air quality modeling analyses and the database for tracking development activities. In the meantime, please advise us if you schedule a meeting to discuss additional source and fugitive dust control in the PRB.

Detailed Comment Responses:
Air Quality

1. The FEIS wording in Section 3.4.1.1 has been revised as suggested.

2. Section 3.4.2.1 has been revised to include updated information on the status of the $PM_{2.5}$ standard.

3. As indicated in Section 4.0 of the Maysdorf EIS, the cumulative impact analysis in the EIS is based on the PRB Coal Review, which is a regional technical study to assess cumulative impacts associated with past, present, and reasonably foreseeable development in the Powder River Basin. The study, which is almost completed at this point, was conducted for BLM by the ENSR Corporation of Fort Collins, Colorado. The reasonably foreseeable development scenario included in the EIS is based on projected levels of mineral production for 2010, 2015, and 2020. The development projections include coal mine development, coal-related activities, and non-coal related activities. The development levels projected in the PRB Coal Review are based on projected coal and other energy demand. The rationale for determining the reasonably foreseeable coal and energy development scenario summarized in the Maysdorf EIS is discussed in more detail in the Task 2 report of the PRB Coal Review, which can be accessed on the BLM Wyoming website at: http://www.wy.blm.gov/minerals/coal/prb/prbdocs.htm.

There have been and will continue to be many coal and energy development project proposals in the PRB. In the past, some proposals have been developed and some have been abandoned. It is likely that this pattern will continue. While the Wyoming Infrastructure Authority has formally solicited a demonstration of electricity production using coal gasification authority and there is funding available from the Department of Energy under the Energy Policy Act of 2005, there is not yet a proposal using that technology which can be evaluated in terms of potential site specific or cumulative impacts.

As part of the PRB Coal Review, BLM and ENSR developed a database to use in tracking development activities in the PRB. BLM plans to update this database annually in order to continually update the reasonably foreseeable development scenario for the basin.

The following comment in your July 26, 2006 comment letter was previously included in EPA comments on the Draft South Powder River Basin Coal EIS, dated April 16, 2003:

> "The BLM should also acknowledge that the 16 active coal mines are in a row from north of Gillette to the Dave Johnston Mine and thus it appears likely that these mines will continue to expand and fill in this area creating a continuous strip of mines and reclaimed mines for approximately 100 miles. Estimating a width of mining of 10 miles, this potential strip of coal mines would cover one thousand square miles."

This statement assumes that the entire 1,000 square mile area is underlain by economically recoverable coal beds, which is not supported by the geologic data that have been collected in this area. As BLM indicated in its response in the Final South Powder River Basin Coal EIS, the coal deposits in the Wyoming PRB do not form one continuous thick mineable unit stretching from north of Gillette to the Dave Johnston Mine. The currently operating mines are grouped into three areas, which are characterized by thick coal deposits. The coal splits into thinner beds and the quality of the coal deteriorates in the areas between the existing groups of surface coal mines. That is why there are not existing mining operations in those areas and why the existing mines have not leased and are not currently proposing to lease in those areas.

The Dave Johnston Mine is not located in the three mine groups described above. It is located approximately 25 miles south of the southernmost mine in the three groups. As indicated in both the South Powder River Basin Coal EIS and the Maysdorf EIS, the Dave Johnson Mine is no longer in operation. It has relinquished its federal coal leases and is in the process of final reclamation of areas of mining disturbance.

Accordingly, the BLM does not consider the scenario presented in your comments to be reasonably foreseeable. The disturbance area that is analyzed in the PRB Coal Review and presented in the EIS is based on the disturbance that would occur as a result of the projected levels of production discussed above.

The likelihood of reclamation success for various resources and the fact that some resource values may take a long time to return to full function or may not be restored is discussed in the environmental consequences and residual impacts sections in Chapter 3 in the EIS.

Noxious Weeds

The existing approved reclamation plan for the Cordero Rojo Mine includes steps to control invasion by noxious (invasive nonnative) plant species, as discussed in the Vegetation section (Section 3.9) of the EIS. If the Maysdorf tract is leased, the reclamation plan would have to be amended to include operations on the tract and the amended plan would also include steps to control invasion by invasive nonnative plants. Additional discussion of noxious weeds and the mitigation being used to control their spread has been added the vegetation discussions (Sections 3.9 and 4.2.7) in the FEIS.

The Draft EIS for the Maysdorf Coal Lease Application does not include the references to poverty weed or cheat grass discussed in your comment letter.

Wetlands Mitigation

If the Maysdorf LBA Tract is leased, a wetlands mitigation plan will be developed before disturbance is authorized during the process of amending the Cordero Rojo mining and reclamation permit to include the Maysdorf tract. Issuance of the lease will not authorize any disturbance. Jurisdictional wetlands will be reclaimed in accordance with the requirements of the Army Corps of Engineers. Mitigation for impacts to non-jurisdictional wetlands located on the tract will be specified during the permitting process as required by the authorized state or federal agency (which may include Wyoming DEQ, the Office of Surface Mining and Reclamation, or the Federal Surface Managing agency, if any federal surface is included in the tract) or the private surface owner. In this area, BLM or Forest Service may be the federal surface managing agency. A portion of the surface of the Maysdorf LBA Tract (approximately 400 acres) is federal surface which is administered by the BLM. If the Maysdorf LBA Tract is leased, BLM will evaluate mitigation requirements for any wetlands that are located on the federal surface as part of the permitting process, before disturbance is authorized on the tract.

GPO U.S. GOVERNMENT PRINTING OFFICE: 2007 — 660-088 / 12004 Region No. 8

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Casper Field Office
2987 Prospector Drive
Casper, WY 82604-2968

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

PRIORITY MAIL
UNITED STATES POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR
PERMIT NO. G–76

BLM Library
PO Box 25047
Denver CO 80225-0047

PRIORITY
MAIL
UNITED STATES POSTAL SERVICE®
Label 107R, February 2006
www.usps.com